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DISEASES DUE TO PROTOZOAN PARASITES.

SCHWETZ (J.). Un stade leishmaniaoïde dans l'évolution du *Tr. vivax-cazalboui* et du *Tr. congolense-dimorphon* chez l'hôte vertebré (bovidés). Note préliminaire. [**A Leishmania-like Phase in the Development of** *T. vivax-cazalboui* **and** *T. congolense-dimorphon* **in the Vertebrate Host (Bovines). Preliminary Note.**]—*Ann. Soc. Belge Méd. Trop.* 1928. Dec. Vol. 8. No. 3. pp. 315–317.

The morphological relationships between Leishmania and flagellates are so close that they are grouped together. It is well known that under certain conditions leptomas lose their flagella and become leishmania-like and, vice-versa, that in culture Leishmania becomes flagellate.

So far only two of the trypanosomes proper are known to have a leishmania stage—namely, *Schizotrypanum cruzi* and *Trypanosoma vespertilionis*. *T. inopinatum* sometimes assumes a form strikingly like Leishmania. These, however, are special cases.

The author is not able at the moment to give a definite answer to the question whether anything of this kind occurs in connexion with the trypanosomes of the higher animals, but he gives a brief description of four observations made recently (November, 1927) at Stanleyville.

No. 1. A cow, in the blood of which a few *T. congolense* could be found in thick films. Two injections of naganol were given. About a fortnight later the animal was killed. No trypanosomes could be found in the peripheral blood, but both typical and deformed *T. congolense* were found in the heart blood. At places the deformed parasites resembled leishmania. Numerous spores of Sarcocystis were also found.

No. 2. A cow with a practically parallel history, but in this case trypanosomes were fairly numerous in the peripheral blood at the time the animal was slaughtered. In the heart blood numerous large, small, and dividing trypanosomes were found, and here and there rounded leishmania forms.

No. 3. When first examined a few *T. vivax* (and *congolense ?*) were present in the blood. A week later the animal became ill and was slaughtered without any treatment. In the heart blood trypanosomes of different sizes were found and numbers of " leishmania " forms.

No. 4. When first examined moderate numbers of *T. vivax* were found in the peripheral blood. The animal was killed five days later. The heart blood was not examined.

The hearts of cases Nos. 2 and 4 were preserved—the latter without preliminary examination of the heart blood.

Histological examination of these specimens is described in another paper, but it is stated that both isolated and agglomerated "leishmania" forms were found in the cardiac muscle.

SCHWETZ (J.) & FORNARA (L.). Notes d'histologie pathologique sur le *Trypanosoma dimorphon-congolense*. [**Pathological Histology in *T. dimorphon-congolense* Infection.**]—*Ann. Soc. Belge Méd. Trop.* 1928. Dec. Vol. 8. No. 3. pp. 319–324. With 1 text fig.

The authors, while disclaiming to arrive at any definite conclusions, publish an account of their findings in the examination of the hearts of animals infected with *T. dimorphon-congolense*.

The authors have found a variety of forms in tissue "juice" and in sections, and for the sake of simplicity they divide them into five groups.

1. Normal trypanosome forms in the peripheral blood and in tissue juices. The authors are inclined to think that those found in the tissue juice tend to be more slender than those occurring in the peripheral blood.

2. Degenerated forms. These were found in the juice of various organs with the exception of the spleen.

3. "Leishmania" forms with an internal flagellum were found only in the heart.

4. Leishmania forms without internal flagellum. These were found in the blood and juice of the heart, lungs, liver, and spleen.

In one animal these forms were found in a state of division, that is to say, with two nuclei and two blepharoplasts in the heart and lungs.

5. "Chromatic bodies." This was the form most commonly found in the blood, in the juice of the internal organs, and in sections.

Chromatic bodies were also found in the peripheral blood of a guinea-pig, but as this blood was taken some hours after death it is probable that they represented simple post-mortem disintegration.

Chromatic bodies and the normal trypanosomes were always found in capillaries in sections.

Actual trypanosomes were only found in sections of tissues fixed immediately after death; tissues fixed several hours after death only contained chromatic bodies.

The "leishmania" forms found in the sections can be divided into two groups:—

I. Rounded forms with a fairly clear membrane containing a nucleus, a blepharoplast, and a small elongated mass of chromatin somewhat resembling a flagellum. This was sometimes within and sometimes external to the membrane.

II. Rounded forms containing a nucleus and blepharoplast, but no trace of flagellum.

The authors view the "chromatic bodies" as "leishmanic" forms without any membrane. They state that all the forms described clearly represent stages of the same parasite, but the question is whether they represent stages of evolution or involution.

BRITISH MUSEUM 14 29 DEC

The fact that well-defined leishmania forms have been found in the organs only and not in blood smears is an argument in favour of their being resistant and not degeneration forms.

The authors suggest that actually there is both a formation of resistant leishmania forms and simultaneously a destruction of trypanosome forms.

NIESCHULZ (O.). Zoölogische bijdragen tot het surraprobleem. XXVI. Over den incubatietijd bij surrainfecties. [**Zoological Contributions to the Problem of Surra.—XXVI. The Incubation Period of Surra.**]—*Nederl.-Indisch. Bladen v. Diergeneesk.* 1929. June. Vol. 41. No. 3. pp. 253–264.

The author gives details of transmission experiments with horses, monkeys, dogs, guineapigs, rabbits, rats, and mice, and the majority of the results are tabulated.

In 15 experiments in which Tabanus, Chrysops, and Haematopota were used, and the flies were transferred (for the most part) directly from horse to horse, the period of incubation ranged from 7 to 10 days.

In 4 experiments *Tabanus rubidus* was transferred directly from naturally infected carabaos to horses, and in these the period ranged from 7 to 13 days.

In three experiments *T. rubidus* was transferred from infected guineapigs or rats to horses, and in these the period was 7 to 8 days.

In one experiment *T. immanis* was transferred from an infected horse to a Macacus monkey. The period of incubation was 8 days.

Only two experiments were carried out with dogs, and in these there was a marked difference in the period of incubation. *T. rubidus* was used by direct transference from horses. The period in the first experiment was 8–9 days and in the second 28 days.

Eighty-seven tests were carried out with guineapigs using a large variety of flies. The period of incubation ranged from 7 to 41 days; the guineapigs were kept under observation for 2 months. In 39 instances the period ranged from 10 to 14 days. The average period of incubation in rabbits (using Tabanidae and Stomoxys) was $7\frac{1}{2}$ days (5 to 14), and a very similar result was obtained with rats.

In two experiments positive results were obtained with *T. rubidus*, horse to mouse, and in one, rat to mouse, with *S. calcitrans*. The incubation period was 6 to 8 days.

EMELIN (V.) & ZEISS (H.). Die therapeutische und prophylactische Behandlung der Kameltrypanosomiase Su-auru mit Naganol. [**The Therapeutic and Prophylactic Treatment of Su-auru of Camels with Naganol.**]—*Rev. Microbiol. Epidémiol. et Parasitol.* 1928. Vol. 7. No. 4. pp. 462–463. [Authors' German abstract.]

Naganol is the best drug for the treatment of Su-auru in camels. The dose ranges from 4 to 6 grammes injected into the large abdominal vein. In chronic cases condition is rapidly recovered after treatment, and animals are fit for work in a few weeks. A single dose is said to be sufficient to effect a cure.

As a prophylactic doses of 5 to 10 grammes have been given. Doses above 10 grammes are unnecessary. No other prophylactic measures of any kind are necessary.

ZIJP (P.). Waarde van de therapeutische aanwending van Naganol en Atoxyl tegen Surra bij het paard, mede in verband met de wettelijke bestrijding dier ziekte. [**The Therapeutic Value of Naganol and Atoxyl in the Treatment of Surra in the Horse, and the Control of Animal Diseases under Schedule.**]—*Nederl.-Indisch. Bladen v. Diergeneesk.* 1929. June. Vol. 41. No. 3. pp. 239–252.

During the period September, 1927, to June, 1928, 104 horses were treated. Of these 36 died within three months, and 10 were not kept under observation, and during the whole period reviewed the total number was about 200. These cases were largely kept under observation by district officers on the author's staff. The conclusion arrived at is that fairly good results may be obtained if treatment is begun sufficiently early, but when the nervous system has become invaded by trypanosomes treatment fails. It is not known whether animals which appear to have been treated with success are still a source of infection.

BROWNING (C. H.), COHEN (J. B.), ELLINGWORTH (S.) & GULBRANSEN (R.). **The Trypanocidal Action of Some Derivatives of Anil and Styryl Quinoline.**—*Proc. Roy. Soc.* Ser. B. 1929. July 4. Vol. 105. No. B735. pp. 99–111.

This paper describes the action of a number of basic derivatives of anil and styryl quinoline on trypanosome infections. New types of trypanocidal agents are described, and certain members of the styryl series have yielded good results. The paper is divided into two sections: Biological and Chemical.

The biological tests were carried out with mice and three strains of *T. brucei* were used, Prowazek's strain from Frankfort and two strains furnished at different times by the Pasteur Institute, Paris (Ehrlich's *ferox* strain). These strains almost invariably killed mice at about 72 hours. Tests were carried out with arsacetin, tryparosan, trypaflavin, trypanblue, and " Bayer 205 " to ascertain that the therapeutic results with the respective strains were closely similar.

As a rule, treatment was instituted on the day following inoculation when parasites were scantily present in the blood, and a subcutaneous injection at the rate of 1 cc. per 20 grammes body-weight was given of a large number of compounds. The concentrations of the drugs used are given in a table. Broadly speaking, it may be said that they ranged from 1 in 100 to 1 in 15,000.

To begin with, a dose was chosen which approximated to the largest amount borne by uninfected animals without the production of toxic effects. The blood was examined daily for a month and at intervals afterwards for 2 or 3 months before a cure was recorded. The most active substances were also tested on chronic trypanosomiasis produced by *T. brucei* in rabbits.

The trypanocidal activity of the substances appears to depend upon the presence in each of the nuclei of basic groups or at any rate of acylamino groups. The most marked actions were produced by substances containing a free basic group in one nucleus and an acylamino group in the other.

The anil quinolines in general had little trypanocidal action, although they are, for the most part, powerful germicides; some, however,

showed a trypanocidal effect, as did some acylated acetylamino derivates. The introduction of a chloracetyl group into one of the compound increased the trypanocidal action, and in fact, this was the only instance of a cure being effected with one of the anil series. Unfortunately, the substance was acid, and it produced necrosis. This introduction of the chloracetyl group did not produce the same increase of trypanocidal power in another compound in which a similar charge was made.

The styryl quinolines were found to be more effective as trypanocidal agents than the anil compounds; they were, however, more toxic for the mammalian host. Further, the most effective trypanocides were generally weakly antiseptic towards bacteria.

It is not possible to abstract the account given of the effects of variation in the constitution of the styryl compounds. Suffice it to say that the acetylamino derivates were probably the most active, and that the introduction of halogen into the acyl group diminished the trypanocidal action. This contrasts with what occurred in the anil series where the chloracetylamino compound was the most effective.

The substance 2(p-amino styryl)—6 acetylamino quinoline methochloride was a very effective trypanocide. Cures were occasionally effected with even one-fiftieth of the maximum tolerated dose. Cures were effected when one-third of the tolerated dose was given to mice in a moribund condition, which had been inoculated 73 hours previously, and whose blood was swarming with trypanosomes. The corresponding methosulphate was equally active. Different strains of trypanosomes were found to vary in their susceptibility to the drugs for with some a small fraction of the tolerated dose effected a cure; with other strains the range of effective dosage was greatly restricted.

The conditions for effective action appear to be the simultaneous presence of (*a*) an acyl amino group either in the benzene or in the quinoline nucleus, and (*b*) a basic group either primary or tertiary in the other nucleus. Acetylation of the amino group frequently reduces the toxicity for the host and a larger dose with proportionally greater trypanocidal action is borne. Little or no prophylactic effect could be produced by injection prior to inoculation, and no evidence was obtained of absorption from the alimentary canal. Trypanocidal action appeared to be far less pronounced *in vitro* than *in vivo*.

The development of a drug resistant strain to one of the compounds used rendered it possible to show that such a strain was resistant to some of the trypanocides already in use, but not to others.

While resistance can be acquired by trypanosomes subjected to increasing (non-sterilizing) doses of a drug, it is of interest that when in a particular animal each of successive relapses is treated by the same moderate dose, drug-resistance does not tend to develop. In another paper it has been shown that a cure may be effected in this way. With the ferox strain it was not infrequently observed that after treatment with a non-sterilizing dose of a styryl compound an extremely chronic infection resulted.

Two of the compounds (No. 8) 2 (p-amino styryl)—6 acetylamino quinoline methochloride and (No. 90) 2 (p-acetylamino styryl)—6 dimethylamino quinoline methochloride, which were very effective in mice, were tested with rabbits inoculated with Prowazek's and the ferox strains from 3–5 weeks after infection when symptoms had

developed. The substances were injected subcutaneously in watery solution. Intravenous injection caused immediate death almost invariably.

Of eight infected animals treated with No. 90 in doses of 0·02 gram per kilo 5 were cured and 3 relapsed. One of the latter, when seriously ill, received 0·03 g. and a cure resulted. Of five animals receiving 0·022 to 0·025 g. per kilo all were cured. Of two which were given 0·025 g. per kilo one was cured and one relapsed. The latter was then treated with 0·04 g. per kilo of " old salvarsan " intravenously ; relapse again occurred which was cured by a subcutaneous injection of " Bayer 205," 0·2 g. per kilo.

After the administration of No. 90 to rabbits the urine rapidly acquires the colour of a dilute solution of the substance. Caustic soda was added to the urine and a deeply tinted precipitate of phosphates was separated by centrifuging. The colour was extracted by warm alcohol, and after the alcoholic extract had been evaporated by heating the residue was dissolved in water. This solution had a therapeutic effect indicating that the substance is excreted in part in the urine in an active form. Treatment in the same way of urine from a control animal yielded an inactive extract.

BOSHENKO (B.) & ZEISS (H.). Ueber Schaftrypanosomiase in Russland. [**Trypanosomiasis in Sheep in Russia.**]—*Rev. Microbiol, Epidémiol. et Parasitol.* 1928. Vol. 7. No. 4. pp. 461–462. [[Authors' German abstract.]

The authors record the occurrence of the trypanosome already described in England and Germany.

KNOWLES (R.) & GUPTA (B. M. Das). **A Tricercomonas of the Pig.**—*Indian Jl. Med. Res.* 1929. Jan. Vol. 16. No. 3. pp. 647-652. With 2 plates (1 coloured).

The organism was found to be present in large numbers in the caecal contents of a pig which had been used experimentally in connexion with hookworm investigation. Vigorous cultures were obtained in Row's haemoglobin-saline medium, and subcultures were grown in a modified Boeck and Drbohlav's medium.

The parasite is particularly characterized by its large size and its sluggish movements. It has a shape resembling a broad ovate leaf and measures from 10 to 20μ in length by 7 to 14μ in breadth. Three flagella arise from the anterior group of basal granules, and these beat in unison and slowly. They are slightly shorter than the body. There is a longer, apparently independently acting, trailing flagellum which arises from the same source.

No cysts were observed in the caecal contents, nor have any been found in the cultures.

The authors discuss at some length the identity of the parasite and conclude that it should be named *Tricercomonas suis* n. sp.

KNOWLES (R.) & GUPTA (B. M. Das). **A Note on a Trichomonas of the Porcupine.**—*Indian Jl. Med. Res.* 1929. Jan. Vol. 16. No. 3. pp. 653–655. With 1 coloured plate.

The parasite was found in the caecal contents of a porcupine, though in small numbers only. Cultures rapidly became crowded with Bodo and Blastocystis which killed off the Trichomonas.

The body, measured along the axostyle, ranged from 18 to 26μ, the width from 6 to 14μ, the anterior flagella from 8 to 25μ and the posterior flagellum measured along the edge of the undulating membrane and beyond to the tip 24 to 45μ.

No cysts were found either in the caecal contents or in the culture.

KRIJGSMAN (B. J.). De therapie der coccidiose. Deel II. Hoender-coccidiose. [**The Therapy of Coccidiosis of Poultry.**]—*Tijdschr. v. Diergeneesk.* 1929. July 15. Vol. 56. No. 14. pp. 734–748. With one chart in text.

The author describes experiments in which cresol, formaldehyde, catechu, areca nut, and naganol were given per os. Naganol and yatren were also given by injection; the former subcutaneously and the latter intravenously. No therapeutic results were obtained. The administration of lactose to slightly affected birds appeared to effect an improvement, but this was probably on account of its nutritive properties only.

CARPANO (M.). Su di un piroplasma osservato nei polli in Egitto (*Aegiptianella pullorum*). Nota preventiva. [**A Piroplasma detected in Poultry in Egypt.**]—*Clinica Veterinaria.* 1929. June. Vol. 52. No. 6. pp. 339–351. With 3 plates.

In this paper the author describes an intra-corpuscular parasite found in the blood of Sussex and Rhode Island poultry imported into Egypt for breeding purposes. It has commonly been observed that in the blood of native poultry an occasional anaplasma-like body can be found. The imported birds became seriously ill a few days after arrival. Microscopic examination failed to show any evidence that they were suffering from spirochaetosis. Careful examination of stained blood films revealed the presence of intracorpuscular parasites bearing a resemblance to piroplasms.

In fresh films the parasites could be detected as refractile bodies which were capable of executing slow movements of translation within the infected corpuscles. Detailed study of the parasites in stained films was not easy on account of their small size.

The author found fixation for a few seconds in methyl alcohol to be the best fixative, and for staining he used 5 drops of Giemsa in 10 cc. of water allowing the stain to act for two hours.

The great majority of the parasites were intra-corpuscular, but occasionally one could be found free in the plasma. The parasites ranged in size from 1 to 3 or 4 microns. The majority were rounded, some were club-shaped.

The smallest forms comprised a nuclear granule of chromatin with a very small amount of cytoplasm.

Larger parasites varied considerably in shape, being oval, round, and even polygonal. In particularly well-stained parasites at this stage a principal nuclear mass and a smaller accessory piece of chromatin could be made out. In some of them a central vacuole could be seen. In still larger forms, ranging exceptionally up to 4 microns the chromatin was frequently arranged in the form of an incomplete ring or in the form of a number of separate granules. In these the accessory chromatin granule could be found, less deeply stained, in a central position.

Reproduction takes place by schizogony. Chromatin fragments dispose themselves around the edge of the parasite and each separates off a small amount of cytoplasm around it forming a rosette-like body. The usual number of merozoites thus formed is 12.

Ten per cent. of corpuscles may be invaded, and though, as a rule only one or two parasites are found in a single erythrocyte, as many as 6 have been encountered.

Nothing is known for certain regarding the natural method of transmission, but *Argas persicus* is possibly concerned.

Experimental inoculation results in the appearance in the blood corpuscles of anaplasma-like bodies about the 10th day. Then the characteristic forms of the parasite develop.

The author suggests the formation of a new genus *Aegyptianella* and names the parasite *Aegyptianella pullorum* (Carpano 1928).

FREUND (S.). Die Piroplasmosen der Rinder in Palästina. Ein Beitrag zu ihrer Aetiologie, Symptomatologie, und Behandlung. [**The Piroplasmoses of Cattle in Palestine. A Contribution to their Etiology, Symptomatology and Treatment.**]—*Therapeutische Monatshefte f. Veterinärmedizin.* 1929. May. No. 5. pp. 129–134; & June. No. 6. pp. 152–162.

This is a report to the Tropical Congress held at Cairo December 15th-22nd, 1928.

Bovine haemoglobinuria in Palestine is caused by *Babesia bigemina* and by a small parasite allied to *Babesia bovis* and *Babesiella berbera*. In the majority of cases satisfactory results are obtained with trypanblue in *B. bigemina* infections, but failures are by no means unknown. With the small parasites the results are far more unsatisfactory.

Theileriasis is caused by organisms belonging to the *Theileria dispar, Theileria annulata* group, and possibly some cases are due to *Gonderia mutans*. The etiology of these conditions has not yet been cleared up completely.

Anaplasmosis, which is due either to *Anaplasma marginale* or *centrale*, as a rule runs a prolonged course, but does not terminate fatally.

Atoxyl with antimosan or stibosan yields the most satisfactory results in cases of theileriasis and anaplasmosis, provided treatment is begun sufficiently early. Atoxyl should be given subcutaneously in 7 per cent. solution. Antimosan is best injected either intravenously or intramuscularly. The combination of drugs is superior to atoxyl alone, and antimosan appears to reduce the fever, and improve the general condition of animals.

SERGENT (E.), DONATIEN (A.), PARROT (L.) & LESTOQUARD (F.). Sur l'existence de corps en grenade dans le cycle évolutif de *Gonderia mutans*. [**The Existence of "Grenade Bodies" in the Cycle of Development of** *Gonderia mutans*.]—*Bull. Soc. Path. Exot.* 1929. July 10. Vol. 22. No. 7. pp. 542–544.

In this short paper the authors give details of experiments which furnish confirmation of the observation made by THEILER and GRAF, this agreeing with the view put forward by BRUMPT, that in the cycle of development of *Gonderia mutans* schizogonous forms (plasma bodies) occur as in the cycle of Theileria.

Three calves which were infected naturally or experimentally with *G. mutans* suffered from serious relapses to the parasite after splenectomy had been performed. Typical, though scanty, plasma bodies could be detected in the peripheral lymphatic glands. The calves were free from infection with *Theileria dispar*. The authors agree that the genus *Gonderia* should lapse and that the parasite should become *Theileria mutans*.

DE ASÚA (F. J.), DIOS (R. L.), ZUCCARINI (J. A.) & KUHN (M. J.). Estudios sobre "Tristeza" (piroplasmosis y anaplasmosis bovina). [**Studies concerning "Tristeza" (Bovine Piroplasmosis and Anaplasmosis).**]—*Rev. Inst. Bacteriol. del Dept. Nac. Hig.* 1928. Mar. Vol. 5. No. 2. pp. 251–330. With 5 text figs., 20 charts & 3 coloured plates.

The authors describe at some length the changes occurring in the blood, and in the solid organs. They also give an account of the part played by the reticulo-endothelial system.

CURASSON (G.). Les piroplasmoses au Soudan. [**The Piroplasmoses of the Sudan.**]—*Bull. Soc. Path. Exot.* 1929. May 8. Vol. 22. No. 5. pp. 319–323.

This paper is a summary of existing knowledge.

DIEBEN (C. P. A.). Anaplasmosis-behandeling bij het rund. [**The Treatment of Anaplasmosis in the Ox.**]—*Nederl.- Indisch. Bladen v. Diergeneesk.* 1929. June. Vol. 41. No. 3. pp. 265–270.

When Dieben took charge of a dairy farm at Weltevreden in 1927 his colleague MEREUS warned him that serious losses were occurring and that the exact nature of the disease had not been established.

The condition ran a rather acute course and was characterized by fever, wasting, jaundice and anaemia.

Examination of blood films revealed the presence of anaplasms, and this diagnosis was confirmed at the Laboratory at Buitenzorg.

Some cases were treated with intravenous injections of collargol (0·5 : 60) [The exact meaning of this is not quite clear.] and subcutaneous injections of 40 cc. of urotropine solution. The strength of this solution is variously described in the text and in the Dutch, German and English summaries as 40, 4, and 0·4 per cent.

10 cc. of "digalen" were also injected subcutaneously at the same time. Brandy and coffee extract were given per os.

Good results are said to have been obtained but no details are given.

CUILLÉ (J.) & DARRASPEN (E.). Considérations pratiques sur le traitement de la piroplasmose du chien. [**Practical Considerations in connection with the Treatment of Canine Piroplasmosis.**]—*Rev. Gén. Méd. Vét.* 1929. Mar. 15. Vol. 38. No. 447. pp. 138–141.

The authors have drawn attention in a previous publication to the frequent occurrence of canine piroplasmosis in the South of France, and have emphasized the fact that atypical cases occur in which the

parasite cannot be detected in the blood. They hold, however, that the rapid response of such cases to treatment with trypanblue is sufficient to establish the diagnosis.

A number of writers have drawn attention to the alarming results which may follow the injection of large doses of trypanblue into cattle, due apparently to sudden destruction of the parasites and the liberation of a large amount of toxin. The Staff of the Pasteur Institute in Algiers have drawn particular attention to this point.

The authors of the present paper have never encountered such alarming results in dogs, and they have formed the opinion that large doses act more rapidly and are more effective.

They give 1 centigramme per kilo. intravenously either into the saphena or into the jugular vein. Within a couple of hours the mucous membranes become blue, the temperature drops suddenly to nearly normal, and the parasites disappear from the peripheral circulation. The following day the animals have improved greatly in condition, the haemoglobinuria has given place to bilirubinuria, and this gradually disappears, as does the albuminuria. In some cases these effects are not produced by the first dose. The mucous membranes do not become coloured, the temperature remains high, and depression persists. A further injection of the same or double the dose should be given in such cases. The authors state that destruction of the parasites only takes place if the patient becomes blue.

They have never had any adverse results from large doses. They have given 2 grammes of trypanblue to a dog weighing 10 kilos and heavily infected, without provoking the least reaction.

Trypanblue injected subcutaneously is very likely to lead to abscess formation, and this may occur if any of the drug gains access to the connective tissues during intravenous injection.

The solutions used should be sterilized and injected at body temperature to obviate any precipitation. If cold solutions are prepared there is a great tendency for them to set into a jelly.

The authors prepare their solution for injection as follows. The trypanblue is ground up in a mortar with a few drops of 90 per cent. alcohol until they are intimately mixed, and by degrees hot sterile water is added with continued grinding. The solution is injected when the hot solution has cooled down to about body temperature.

While trypanblue may give surprising results in desperate cases it must be admitted that it is far more efficacious if given early. If employed late in the course of the disease when the renal and hepatic functions have been seriously injured, the drug may hasten the fatal termination. The slight shock caused by the injection may cause death. After injection the general condition must be attended to, and in particular the anaemia must be made good. Blood transfusions are very useful.

HEGNER (R.) & SCHUMAKER (E.) **Some Intestinal Amoebae and Flagellates from the Chimpanzee, Three-Toed Sloth, Sheep and Guinea-Pig.**—*Jl. Parasit.* 1928. Sept. Vol. 15. No. 1. pp. 31–37. With 11 text figs.

Three types of amoebae were found in a non-dysenteric chimpanzee which died in the Zoological Gardens at Baltimore. These were cysts resembling *E. histolytica, E. coli* and cysts and trophozoites of a species similar to *Iodamoeba williamsi*. In all at least eleven species of

amoebae have been reported from monkeys, and of these nine have been placed in the genus *Endamoeba*. In a three-toed sloth (*Bradypus griseus griseus*) which died in Baltimore three weeks after importation from Panama a cyst of an Endamoeba was found. It possessed eight nuclei of the histolytica type, but the details of the arrangement of the chromatin differed from that type. The name *Endamoeba bradypi* is proposed. The same host harboured trophozoites of Giardia, which resembled those occurring in rabbits and guineapigs.

In serum-saline-citrate cultures from the intestinal contents Embadomonads were found. Nothing distinctive was detected in the trophozoites, but the cysts differed from any hitherto described in that there appeared to be either a swelling of the cyst wall or an attachment of the cytoplasm to the cyst wall at the anterior end.

The authors examined by culture 52 guineapigs and from the caeca of 14 of them they recovered Embadomonas. Measurements of the parasites are given both for the trophozoite and the cystic stages.

Similar details are given of measurements of *Embadomonas ovis* cultivated from the faeces of sheep.

LEDENTU (G.), SICÉ (A.) & VAUCEL (M.). Formes schizogoniques d'un sporozoaire du cobaye. [**The Schizogonous Forms of a Sporozoon of the Guineapig.**]—*Bull. Soc. Path. Exot.* 1929. May 8. Vol. 22. No. 5. pp. 323–325. With 7 text figs.

The authors have found the bodies figured and described in this paper in the blood and in liver smears of guineapigs.

Some of the forms were found in the blood of two guineapigs which died three weeks after inoculation with blood taken from two Europeans suspected of being infected with trypanosomiasis.

No trypanosomes were found at any time in the inoculated guineapigs. After death blood smears and liver smears were made. Other forms were found in blood smears of a guineapig which died nearly seven months after inoculation with blood containing trypanosomes from a human being. The patient had resisted several prolonged treatments with atoxyl and tryparsamide. Trypanosomes were found in the guineapig's blood on several occasions. The duration of life after inoculation was exceptionally long.

The authors do not think that the organisms were in any way connected with the trypanosomes, nor were they, in their opinion, another parasite inoculated from the human patients. They believe that they were parasites of the guineapigs.

Smaller forms of the organism measured about 10μ in diameter and contained two nuclei. Other forms containing large numbers of nuclei ranged up to 20μ or more in diameter. Vacuolation of the protoplasm was distinct, and in some of the larger forms there was evidence of impending separation of the cytoplasm around the nuclei prior to schizogony.

NAKANISHI (S.). **A Study of Sarcosporidia in Korean Cattle.**—*Jl. Jap. Soc. Vet. Sci.* 1929. June. Vol. 8. No. 2. pp. 119–127.

Examination of calves used for the preparation of rinderpest serum and virus has shown that during the last four years of 1,922 animals 1,893 or 98·5 per cent. have harboured sarcosporidia. Experiments with rabbits showed that intravenous inoculation with cysts crushed up in

saline containing 1 per cent. glucose caused death in 24 hours. The symptoms presented were irritation and excitement, acceleration of pulse and respiration, an elevation of temperature, dullness, severe diarrhoea, paralysis, coma and death. The lesions found were softening of the cerebrum and cerebellum, congestion of the heart and kidneys, slight inflammation of the intestines, and engorgement of the liver.

The author believes there are three kinds of sarcosporidia infecting cattle which he describes in a tabular form under the headings A, B and C. He prefers not to use the definite terms, genus or species in his description.

Type A is of very rare occurrence. It is rounded or oval in shape and measures 200–400μ ; the spores are 7–8 by 2–3μ. The presence of the parasite causes a marked tissue reaction. The cyst membrane is not striated and it has a hyaline lining. The parasite occurs in connective tissue of serous and mucous membranes.

Type B is the most commonly occurring type. This is elongated in shape and measures 1,500–2,500μ by 200–260μ. The spores are 5–14μ by 4·5–6μ. The presence of the parasite causes little or no tissue reaction. The cyst membrane has an outer striated layer and an inner hyaline one. The heart and skeletal muscles are the predilection seats. Emulsions of this parasite are toxic for the rabbit.

Type C is frequently encountered. This type is very long and slender measuring 4,000–9,000μ in length by 400–900 in thickness. The spores are also larger than in the other types and ranged from 13·3-27·5μ by 4·7–7·0μ. In its other characters it resembles type B.

CURASSON (G.) & ANDRJESKY (P.). Sur les " corps de Balfour " du sang de la poule. [**Balfour Bodies in the Blood of Poultry.**]—*Bull. Soc. Path. Exot.* 1929. May 8. Vol. 22. No. 5. pp. 316-317.

The intracorpuscular bodies described by BALFOUR (in 1907) as occurring in the blood of fowls in the Sudan have been accounted for in a variety of ways by a number of investigators.

As opportunity offered the authors have carried out investigations regarding the nature of these bodies. The difficulty of obtaining birds free from spirochaetosis has hindered the work to a large extent, and although their experiments are not complete their observations tend to support the view, already expressed by others, that these bodies are not connected with spirochaetosis.

In one experiment 3 young birds showing Balfour bodies in their red corpuscles were placed in a cage where cases of spirochaetosis had been housed and in which there were numerous Argas in various stages of development. The birds all contracted spirochaetosis and were successfully treated with atoxyl without the Balfour bodies undergoing any change. On two occasions at the experimental station when there were no cases of spirochaetosis among the poultry and in spite of that all were treated with novarsenobenzol because certain birds appeared anaemic and dull, Balfour bodies were found in the blood of a considerable proportion of the birds. The blood of birds was examined for fifteen days after Balfour bodies had disappeared, but spirochaetes were never detected.

Two young birds which gave a negative blood examination were given 3 centigrammes of novarsenobenzol (a larger dose than usual) and half an hour later they were injected intravenously with 0·5 cc. of

blood containing Balfour bodies. A week later these appeared in the birds' blood and persisted for 12 days. Examination was continued for 10 days, but spirochaetes were not found.

A young dove inoculated intramuscularly with blood containing Balfour bodies showed the bodies on the 5th day. It died suddenly on the 7th day, and numerous Balfour bodies were found in the blood of the lungs.

A crested crane was also inoculated and vacuole-like bodies which failed to stain with Giemsa appeared in the blood on the fourth day. The development of these structures was followed daily, and it is said that they developed into forms resembling ring-shaped piroplasms, and that certain of them closely resembled *Gonderia mutans*. They disappeared on the 6th day after they had made their appearance. The bird showed no sign of ill-health and no spirochaetes were found at any time.

LEVADITI (C.), SANCHIS-BAYARRI (V.), LÉPINE (P.) & SCHOEN (R.). Etude sur l'encéphalo-myélite provoquée par le *Toxoplasma cuniculi*. [**Encephalomyelitis caused by** *Toxoplasma cuniculi*.]—*Ann. Inst. Pasteur.* 1929. June. Vol. 43. No. 6. pp. 673–736. With 48 figs. & 1 coloured plate.

NICOLLE (C.), ANDERSON (C.) & COLAS-BELCOUR (J.). Premiers essais d'adaptation du spirochète des poules à divers Ornithodores. [**First Attempts to adapt the Spirochaete of Poultry to Various Ornithodorous Ticks.**]—*C.R. Acad. Sci.* 1928. Nov. 5. Vol. 187. No. 19. pp. 791–792.

DISEASES DUE TO METAZOAN PARASITES.

DE ALMEIDA (E.). [In Portuguese & French.] *Stephanurus morai* n. sp. nova especie do genero *Stephanurus*. [*Stephanurus morai* **n. sp. New Species belonging to the Genus** *Stephanurus*.]—*Bol. da. Assist. Méd. aos Indigenas.* Loanda. 1928. Nov. Vol. 2. No. 11. In Portuguese pp. 240–241. In French pp. 241–242.

The author figures and describes a Stephanurus occurring in pigs throughout the Cazengo-Pungo Andongo region.

The principal characteristic feature of the parasite is that the vulva is near the middle of the body. The males measure 22 mm., the females 34 mm. and the eggs 90–100 μ.

DIEULOUARD. Habronemose pulmonaire des Equidés. [**Pulmonary Habronemiasis of Equines.**]—*Rec. Méd. Vét.* 1929. Apr. Vol. 105. No. 4. pp. 206–212.

The author briefly reviews the literature regarding the occurrence of pulmonary habronemiasis in horses, and continues that he has been well placed for studying the relationship between pulmonary and cutaneous habronemiasis by examining the horses killed for anatomical and surgical instruction at the Army Veterinary School in Brazil.

Of 20 horses which were found to have pulmonary habronemiasis 19 were found to show evidence of having had " summer sores " at some time during their life. There is then evidence of close relationship between the two conditions. This has been observed by other writers.

The pulmonary condition apparently comes into existence only when the summer sores are considerable in extent and have been in existence for some time.

The view has been expressed that the invasion of the lung takes place via the respiratory tract, but the facts contra-indicate that. Were that the case large numbers of cases of pulmonary habronemiasis would be found in horses living where habronema are numerous. On the other hand, it has been found that the pulmonary lesions (which bear a close remembrance to glanders nodules) occur only in animals showing evidence of skin infestation.

It has been proved experimentally by TORRES that larvae of *Habronema muscae* can pass to the lungs of guineapigs when placed upon skin wounds.

The invasion of the lungs by the larvae may result in a sero-sanguinolent discharge from the nose which persists for about 48 hours.

In hot countries the disease may pass unobserved, but in colder countries the invasion of the lungs appears to render the animal susceptible to complications.

In a bad case the lungs may be packed with nodules having a thick fibrous capsule and a mass of greyish material in the centre which is readily enucleated. In sections of recently formed nodules the coiled embryo can be detected.

BROWN (H. W.). **Further Studies on the Longevity of the Eggs of** *Ascaris lumbricoides* **and** *A. suum.*—*Jl. Parasit.* 1928. Sept. Vol. 15. No. 1. pp. 14–22. With 1 graph.

A considerable amount of evidence has been accumulated regarding the powers of resistance of these eggs to external condition, but most of these conditions do not closely correspond with those occurring in nature—the conditions were to a large extent artificial.

The present paper is based upon experiments to test the longevity when exposed to natural conditions summer and winter. Only a single type of oil, namely, sand, was used, and many more experiments using other soils are yet required.

The eggs of these worms can be stored for use in solutions of formalin without ill-effect. In one experiment they were kept in 7·5 per cent. formalin for two weeks before they were used, segmentation will proceed in 2 per cent. formalin at room temperature.

The eggs are found to withstand the effects of freezing and thawing in various stages of embryonic development equally well, but warmth accompanied by dryness tended to be destructive to vitality, at least in the sand used in the experiment. It was not proved, however, that eggs exposed to these changes of temperature were definitely infective, although it is probable that they were.

While warmth and dryness proved lethal to the eggs in the sand used, it is clear that other results might be obtained with soils not drying so readily or so completely as sand—which dries out rapidly.

ACKERT (J. E.) & HERRICK (C. A.). **Effects of the Nematode** *Ascaridia lineata* **(Schneider) on Growing Chickens.**—*Jl. Parasit.* 1928. Sept. Vol. 15. No. 1. pp. 1–13. With 1 text fig. & 2 plates.

In an experiment involving the use of over four hundred chickens raised in confinement the authors have studied the effect of parasitization with this worm. During the first three weeks the herds show sluggishness, loss of appetite, ruffling of the feathers, drooping of the wings, loss of body-weight, anaemia. The worms appeared to be eliminated from the intestine continuously from the time of hatching

until most of the worms were lost, but the rate of loss was accelerated after the 18th day. Chicks that survived three weeks of infestation generally recovered, and sometimes showed subsequently better development than the controls.

Chicks previously parasitized showed a definite resistance to the nematodes by the time they were about 3 months old, but such chickens were distinctly affected by subsequent parasitism from eggs given when the chicks were less than three months old.

The worm did not appear to affect egg laying.

FAUST (E. C.). **Studies on *Thelazia callipaeda* Railliet and Henry, 1910.** —*Jl. Parasit.* 1928. Dec. Vol. 15. No. 2. pp. 75–86. With 4 coloured figs. on 2 plates & 2 text figs.

Worms from both human and canine sources belong to the same species *Thelazia callipaeda*, as does also that of the rabbit.

In dogs the infection appears to be acquired during the summer months, but it appears that maturity is not reached until several weeks after infection. It has been found possible to transfer the infection to other dogs and to rabbits, and to some extent to the cat and the monkey. Goats and sheep are not suitable as hosts.

The adult worms live free in the conjunctival sac, and in one case have they been found to penetrate the lachrymal canal or to burrow into the connective tissue. In cases of multiple infection (up to 50 worms) the two sexes are present in approximately equal numbers. The male worms measure 8 to 13 mm. and the females 12 to 16 mm. in length. In both sexes the cuticle is for the most part folded to as to give an appearance of segmentation, the edges of the folds being sharply defined. The parasite has been reported from India and China.

A mature larval stage detected in a papilloma of the lower eyelid in a human host was similar in structure to the adult worm. It has not yet been possible to work out the life-cycle of the parasite, but the possibility of an arthropod vector is not excluded. Continuous infection leads to excessive lachrymation and opacity of the cornea.

SEN (S. K.). **Report on Microfilariae in Horses at Mona.**— *Vet. Jl.* 1929. April. Vol. 85. No. 4. pp. 177–178.

Measurement of eleven parasites showed that the size ranged from 150μ to 230μ with an average of 194. It is not clear whether these measurements can be accepted definitely, as the author states that "the 'fixed spots' could not be located with certainty owing to the specimens having undergone shrinkage." A provisional diagnosis had to be made upon the length of the specimens alone. The author makes a brief mention of *Parafilaria multipapillosa* (Yorke & Mapleson, 1926), *Filaria spirovoluta*, Smit & Ihle, 1925, and *Setaria equina* (Abildgaard, 1789), and concludes that the specimens probably represent larvae of *S. equina*.

COCKSEDGE (T. A.). **Chronic Debility of Camels, caused by Hydatid Cysts.**— *Vet. Jl.* 1929. April. Vol. 85. No. 4. pp. 176–177.

In a very large proportion of camels which are destroyed on account of chronic debility the author finds extensive invasions with Hydatid cysts. The lungs and liver are chiefly involved and the cysts range in size from a pea to an orange. As many as forty have been counted in

the lungs alone. The adult parasite is not known, but Cocksedge suspects it to be some parasite of the jackal. The camels in question are all Arabian camels bought in Aden. The native camel is unsatisfactory as a riding animal. It is uncommon to find the cysts in the native animal.

POISSON & RANDRIAMBELOMA. Cysticercose bovine à Madagascar. [**Bovine Cysticercosis in Madagascar.**]—*Rec. Méd. Vét. Exot.* 1929. Apr.–June. Vol. 2. pp. 70–72.

Bovine cysticercosis is fairly widely spread in Madagascar, but it is not of so frequent occurrence as porcine cysticercosis.

BAKKER (S.). Mededeelingen omtrent Distomatosis en zijn behandeling door middel van Distol. [**The Treatment of Distomatosis by means of Distol.**]—*Nederl.-Indisch. Bladen v. Diergeneesk.* 1929. June. Vol. 41. No. 3. pp. 289–312.

The author finds that Distol has some value as a curative agent, but none as a prophylactic. The cost and the necessity for repeated dosing are against its use in the field.

Details of 16 cases are given.

PAVLOVSKY (E. N.). **Control of Ticks in the Province of Novgorod in 1927. I. The Anti-Tick Bath for Cows in the Village of Semenovschino, Province of Novgorod.**—*Rev. Microbiol., Epidémiol. et Parasitol.* 1928. Vol. 7. No. 4. p. 458. [Author's English abstract.]

This paper contains details of the first dip erected in U.S.S.R. for the eradication of *Ixodes ricinus.*

OLENEV (N. O.) & POMERANTZEV (B. I.). **Control of Ticks in the Province of Novgorod in 1927. II. Spraying of Cows with the Arsenious Solutions and its Effect on Ticks.**—*Rev. Microbiol., Epidémiol. et Parasitol.* 1928. Vol. 7. No. 4. pp. 458–459. [Authors' English Abstract.]

PARROT (L.). Notes sur les phlébotomes. II. Sur quelques phlébotomes de la Bohkara (U.R.S.S.). [**Notes on Phlebotomus of Bokhara.**]—*Arch. Inst. Pasteur d'Algérie.* 1928. Mar. Vol. 6. No. 1. pp. 26–34. With 7 text figs.

SENEVET (G.). *Hyalomma mauritanicum* et *Hyalomma lusitanicum.*—*Arch. Inst. Pasteur d'Algérie.* 1928. Mar. Vol. 6. No. 1. pp. 35–41. With 3 text figs.

SENEVET (G.). Clé pour la détermination des larves d'Ixodidés trouvées sur les bovins en Algérie. [**Key for the Determination of Larvae of Ixodidae found on Bovines in Algeria.**]—*Arch. Inst. Pasteur d'Algérie.* 1928. Mar. Vol. 6. No. 1. pp. 42–46. With 10 text figs.

BACTERIAL DISEASES.

HENRY (B. S.). **Spontaneous and Forced Dissociation of** *Brucella abortus* **(Bang).**—*Proc. Soc. Exp. Biol. & Med.* 1928. Nov. Vol. 26. No. 2. pp. 101–102.

In studying the causes of discrepancies occasionally encountered in testing sera of cattle for *Br. abortus* agglutinins it was noticed that

different lots of antigens from certain strains gave varying results with the same sera.

Incubation of agar plates, inoculated with suspensions to be used for antigens, for four days revealed the presence of two types of colonies. One, the usual *Br. abortus* colony, was moist and clear, and only slightly granular, showing by transmitted light a blue-green fluorescence. The second type was opaque, definitely granular and more rapidly growing than the clear type. Subcultures from the clear type readily remain suspended in salt solution, while those of the opaque type are suspended with difficulty; auto-agglutination takes place in 24–48 hours. Subcultures of the opaque type remain free from "clear" colonies, but "clear" cultures occasionally produce an opaque colony even after several platings. Before these spontaneous changes had been noticed, the author had been able to "produce opaque colonies from typical *Br. abortus* cultures by growing the organisms in glucose-glycerine broth to which had been added 10 per cent. of serum from rabbits immunized against *Br. abortus*." The changes occurring in these cultures were more complete than in those in which the changes were spontaneous.

TRAUM (J.) & HENRY (B. S.). **Discrepancies of the Agglutination Test in *Brucella abortus* Infection in Cattle.**—*Cornell. Vet.* 1929. Apr. Vol. 19. No. 2. pp. 105–123. With 9 charts.

The authors have tested a large number of sera against antigens prepared with organisms isolated from different sources. The cultures used were grown on agar containing 2 per cent. glycerin and 1 per cent. glucose corrected to pH 6·8. The flasks were incubated for 72 hours and the growth was then washed off in 0·85 per cent. saline containing 0·5 per cent. phenol. The density was made to 3·5 centimetres on Gates' scale. The majority of the sera were used fresh, samples being selected from those sent in for routine tests. A few samples had been carbolized and these were used within a month of collection. Dilutions of 1 in 25, 1 in 50, 1 in 100, 1 in 200, and 1 in 400 were used. The tubes were incubated overnight at 37° C., left at room temperature for two to four hours, and the results were then read. A second reading was taken after a further 24 hours at room temperature.

The reactions were classed under four headings: (1) Negative when there was no agglutination; (2) Positive when agglutination was complete in 1 in 25 and 1 in 50, and about half complete in 1 in 100; (3) Doubtful but probably positive when the agglutination was complete in the first two tubes but less than half complete in 1 in 100; (4) Doubtful but probably negative when there was agglutination, but it was less than in (3).

The authors have found that some sera agglutinate antigens more slowly than others, and also that some antigens are agglutinated more slowly than others by the same positive sera. They have not found any explanation for this.

In a few cases batches of antigen gave positive or partially positive results with sera yielding clear-cut negative results with all other batches of antigen used in the tests.

In searching for an explanation of the consistently pseudo-positive results given by certain antigens, the strains were plated out before the growth was suspended in phenolized saline. It was observed that the antigens classed as bad would show a high proportion of rough or intermediate to smooth colonies.

The influence of the variants upon the rapid plate method of diagnosis appears to be less marked than on the ordinary tube method.

The authors conclude that the results obtained do not indicate a necessity for using a polyvalent antigen. If distinct agglutinating types do exist separate tests with the separate types are indicated rather than the use of a mixture of types in the same antigen.

SMITH (T.). **A Strain of** *Bacillus abortus* **from Swine.**—*Jl. Experim. Med.* 1929. Apr. 1. Vol. 49. No. 4. pp. 671-679.

In March 1927 an outbreak of infectious abortion occurred among some pigs which had not been fed with cow's milk, but had received garbage which had not been heated. The yards of the premises were infested with rats. There had been no previous record of abortion in the herd. No fresh pigs had been introduced for a year except a boar which came from a free herd.

From foetuses of 3 out of 4 sows cultures resembling *Br. abortus* were obtained. The bacillus was readily recoverable from the heart blood and internal organs of the foetuses. So far as was ascertained the three strains isolated were identical. All grew well in unsealed tubes, and sealing the tubes appeared to retard growth.

In inoculated guineapigs necrotic suppurating foci appeared in the spleen and lymphatic glands. Agglutination tests comprising cross agglutination and absorption procedures failed to distinguish the strain from the bovine type of organism. Although necrotic and suppurating lesions were produced in guineapigs, the lesions were not nearly so extensive as those previously reported as being caused by a strain of porcine origin. A culture fed to a sow in an advanced stage of pregnancy failed to produce abortion, possibly because of the advanced stage. The organism was not recovered from the uterus, but was found in the sow's milk.

BURNET (E.) & CONSEIL (E.). *B. melitensis* et *B. abortus*. Leur pouvoir pathogène per l'homme et le singe. [**The Pathogenicity of** *B. melitensis* **and** *B. abortus* **for Man and Monkeys.**]—*Arch. Inst. Pasteur de Tunis.* 1929. Mar. Vol. 18. No. 1. pp. 21-42. With 5 charts in text.

The authors hold that the most important distinguishing feature of *Br. melitensis* and *Br. abortus* is the range of pathogenicity of the organisms. Some years ago they expressed that view as a result of certain experiments carried out upon human beings and upon monkeys.

Recently considerable numbers of cases of undulant fever have been diagnosed in countries where the occurrence of that disease was unknown or unsuspected. These cases have been attributed in some instances to contact with bovines. The countries in which these cases have occurred furnished the classical evidence that *Br. abortus* was not pathogenic for man.

Objection could be raised to the authors' earlier experiments on the ground that cultures which had not recently been isolated were used. They have therefore reverted to the subject, using freshly isolated strains.

The results of the 1928 experiments have been concordant with those of experiments carried out in 1923. Three monkeys and three human beings inoculated with these strains have not contracted undulant fever, but they have become immunized against undulant fever. While, however, the inoculations produced no febrile disease, the experimental subjects have not remained "indifferent to the inoculation with *B. abortus.*" Two of the monkeys gave positive haemocultures, on one occasion only, on the 15th day after inoculation. The serum contained agglutinins. Two of the human subjects gave positive intradermo reactions, and in the blood of all three agglutinins developed. These results were more pronounced than those obtained in the earlier tests.

As a result of these new experiments the authors affirm not only that the *Br. abortus* is not pathogenic for man, but that the pathogenicity of *Br. melitensis* for man is far greater, and that only *Br. melitensis* is the cause of undulant fever. The case of the third monkey used is particularly instructive, because it was inoculated with a strain isolated from a human being of "undulant fever due to *B. abortus.*" This strain behaved as *Br. abortus.*

Epidemiological facts must be scrutinized and examined critically. In the first place, doubtful cases of undulant fever due to *Br. abortus* must be eliminated. One must be assured of the absence of undulant fever in countries where cases occur in human beings resulting from contact with animals other than goats. Monkeys must be inoculated with strains obtained by haemoculture, and, finally, one must insist upon the differentiation of the two conditions. This, the authors say, is the Gordian knot which must be untied or cut.

In the past it has been hoped that some bacteriological, biochemical or serological character would be discovered which would serve to distinguish the two organisms. To-day the best that one can hope for is a test by saturation of agglutinins.

Br. melitensis and *Br. abortus* appear as the same organism with separate adaptations.

Sachs (A.). **A Medium for the Primary Isolation and Subsequent Subculture of Gonococci, Pneumococci and other Delicate Organisms.**—*Jl. Roy. Army Med. Corps.* 1929. June. Vol. 52. No. 6. pp. 452–453.

The medium is prepared in two parts: A, an alkaline autolysate of meat extract, and B, the peptone agar base. The advantages claimed for the autolysate of meat extract over the alkaline autolysate of ox heart which it replaces (Dimond and Lambkin medium) are that in the tropics the meat extract is more readily obtained and kept. The meat extract autolysate is more readily prepared and it keeps much better and is less frequently contaminated. It is quite satisfactory for primary isolations.

A. Preparation. 2 grammes of lemco and 200 cc. of distilled water are shaken up in a 500 cc. Erlenmeyer flask until there is even distribution of the lemco. 8 cc. of normal NaOH are added with shaking and the mixture placed on ice overnight. Heat in a steamer for 20 minutes exactly. On cooling place on ice again overnight. Repeat the steaming the next day and again leave on ice overnight.

B. Place 12 grammes of fibre agar with 200 cc. of distilled water in a 500 cc. Erlenmeyer flask and melt by steam (preferably under pressure).

Mix together :—

Witte's peptone	12 g.
Sodium chloride	2 g.
Disodium monohydrogen phosphate	2 g.
Glucose	0·4 g.

Add these to the melted agar and shake, heating again in the steamer for half an hour. To use the medium melt the agar and heat the autolysate of meat for 5 minutes and mix in equal volumes. Tube this in 10 cc. amounts and add ¼–½ cc. serum and then slope. The author states that citrated plasma is as good as or even better than blood serum.

CURASSON (G.). Hépatite nécrosante infectieuse du mouton au Soudan. [**Infectious Necrotic Hepatitis of the Sheep in the Sudan.**] —*Rec. Méd. Vét. Exot.* 1929. Apr.–June. Vol. 2. pp. 65–70.

The author detected a disease of sheep which he identifies with braxy near Bamako in 1925, and a fair number of cases have occurred more recently at El Oualadji. At Bamako an organism was isolated from the liver of sheep slaughtered just before death which appears to be the vibrion septique. The disease makes its appearance there at the beginning of the cold season, while at El Oualadji it appears when sheep are pastured on flood land when the water subsides. The removal of the animals to healthy land brings about a cessation of the disease. It is most frequently seen in cross-bred merino-macina sheep. The pure-bred merinos do not go out to graze and hence they escape. It is not seen in native wool breeds.

Symptoms are scarcely ever observed, but they are dullness and lagging behind the flock. Just before death the respiration becomes hurried and the heart tumultuous.

It has not been possible to carry out any detailed post-mortem examinations and consequently an exact description of the lesions cannot be given. The lesions found, however, more closely resemble those described in Australia than those found in European cases, but there are certain differences. In cases which run a somewhat slow course there is slight jaundice and necrotic centres, probably of metastatic origin, may be found in the lungs.

The disease appears to terminate fatally in all cases and the percentage mortality in the flock may range from about 6 to 10 per cent. As yet no attempts have been made to prepare any vaccine.

VRIJBURG. De bestrijding der Bangsche ziekte. [**The Control of Bang's Disease.**] —*Nederl.-Indisch. Bladen v. Diergeneesk.* 1929. June. Vol. 41. No. 3. pp. 283–288.

DISEASES DUE TO FILTERABLE VIRUSES.

JACOTOT (H.). Sur la vaccination contre la peste bovine au moyen de pulpes organiques. Note préliminaire. [**Vaccination against Cattle Plague by means of Organ-Pulp. Preliminary Note.**]—*Bull. Soc. Path. Exot.* 1929. May 8. Vol. 22. No. 5. pp. 310–312.

All attempts hitherto made to vaccinate cattle against cattle plague by means of attenuated or dead virus have failed, but during the last few years a number of investigators have shown that certain tissues of animals infected with the disease can be used for the protective inoculation of other animals.

Jacotot has been carrying on his experiments for a year, and the present paper summarizes the conclusions reached up to the present. A full detailed report is promised later.

1. It is possible to prepare from certain organs of animals suffering from rinderpest an avirulent material which will confer a solid immunity against natural and experimental infection in both bovines and buffaloes.

2. The organs which are specially suitable for the preparation of vaccine in mass are the lymphatic glands, the spleen and the lungs. Satisfactory results are obtained when these organs are taken from the 6th to the 9th day of the disease during the febrile stage. [It would seem that the author means the 6th to the 9th day after inoculation.]

3. The effective dose of vaccine for an Annamite bovine corresponds to an amount of spleen pulp ranging from 15 to 20 grammes. For the buffalo of Annam about twice this dose is required.

Relatively large doses are required for young bovines and pigs, but this phase of the subject has not yet been gone into completely.

4. Immunity is acquired gradually. It is usually recognizable at the end of the first week after inoculation, and complete by the end of the second. To a certain extent the speed at which immunity is acquired is proportional to the rate of absorption of the vaccine.

5. The immunity is of practical value for a year, but there is a recognizable decline by the 8th month.

6. The vaccine gradually loses potency when stored. The author has been able to preserve it for four months, keeping it for two months in a cool chamber at 15° and two months at ordinary temperature (30° C.).

7. The condition of resistance produced by the vaccine protects the animals against the disease, but not against infection. Infection takes place, but produces no evident signs.

By inoculating vaccinated animals with virus, or by allowing them to become infected naturally, the temporary immunity may be converted into a permanent one. The preparation of the vaccine involves two operations. Firstly, the organs are reduced to a very fine pulp, and secondly, antiseptic is added to kill the virus and to prevent bacterial contaminations. A number of antiseptics have been tested for this purpose, and the technique of the preparation of the vaccine actually in use is as follows :—Infected calves are killed on the 7th day after inoculation with virus, and the lymphatic glands, the spleen, and lungs are removed. The tonsils and the thymus, which are specially active, are treated separately. The pulp furnished by these is added to the general mass of the vaccine, after sufficient of this has been taken for testing.

The organs are pulped in a Latapie apparatus, and then have added to them one and a half volumes of normal saline. The thick liquid resulting is passed through a sieve and then has added to it 6 to 8 per thousand formol. The mixture is shaken and flasked. It is then kept at ordinary temperature (30°) in the dark for 24 hours, and subsequently placed in a cool chamber at 15°–20° still in the dark. After three days aerobic and anaerobic cultures are made from it, and if these remain blank it is ready for use.

The dose is 25 cc. for a bovine and 50 cc. for a buffalo.

Subcutaneous injection is followed by a localized inflammatory reaction which gradually subsides. Resorption of the vaccine is complete in about a fortnight.

JACOTOT (H.). Essai d'utilisation des pulpes d'organes à la préparation des boeufs fournisseurs du sérum antipestique. [**An Attempt to utilise Organ Pulps in the Hyperimmunization of Anti-Rinderpest Serum Producers.**]—*Bull. Soc. Path. Exot.* 1929. May 8. Vol. 22. No. 5. pp. 313–315.

Anti-rinderpest serum is a serum of relatively poor value, for large doses have to be employed if good results are to be obtained. There appears to be little to choose on the score of economy of preparation, between the various techniques that are in use for its production at the present time.

It occurred to the author that a serum of higher potency might possibly be produced if organ pulp was used for hyperimmunization without any increase in cost. A small experiment was carried out to test the view.

Two adult Annamite cattle which had been immunized by the simultaneous method six months previously were given one litre of virulent blood and 350 grammes of pulp of the spleen and lungs from a virus producer calf. These animals were bled 8, 15, 22, 29, and 36 days after. The sera were mixed and kept at room temperature without special precautions. In the first experiment for testing this serum two calves were given respectively 60 cc. of the serum to be tested and of a control serum. Nine hours later they each received 1 cc. of virulent blood. The first calf showed no reaction, while the second showed a slight but characteristic rise of temperature and general symptoms of a mild nature.

In the second experiment the dose of serum under test was reduced to 45 cc., while of the control serum the dose was again 60 cc. Eight hours later both animals were given 2 cc. of virulent blood. The first animal showed no reaction, while the second had rather a severe febrile reaction and there were marked clinical signs, but the animal recovered completely.

When the experimental serum was four months old it was utilized again in a 60 cc. dose, a similar dose of control serum being given to another calf. After an interval of 56 hours each animal was given 2 cc. of virulent blood. The first animal showed a few slight irregularities of temperature while the other had a brief febrile reaction and slight clinical symptoms were present.

Three experiments were carried out using this serum for the purpose of serum-simultaneous inoculation—a control with serum ordinarily prepared being included in each test.

In these experiments the dose of test serum was progressively reduced from 60 to 30 cc., the control serum dose remaining constant at 60 cc. In each case the reaction in the control animal was distinctly more pronounced than in the other.

Parallel tests have been carried out in 5 instances with test serum and control serum as curative agents. Intravenous injections of serum have been given to animals which have been at the febrile stage of reaction for at least 48 hours. 100 cc. has been given at the first dose and 80 cc. on the following day, with, in certain cases, 50 cc. also on the 3rd day.

Of the test subjects 4 out of 5 recovered, and the 5th, which was in poor condition, died on the 22nd day after the inoculation with virulent blood.

Of the 5 controls four died of rinderpest and the 5th showed a reaction of moderate severity.

The author concludes that these results indicate that injections of organ pulp for hyperimmunization produce a serum of higher value than those produced by injection of virulent blood or peritoneal washings.

CURASSON (G.) & DELPY (L.). Le vaccin formolé contre la peste bovine. [**Anti-Rinderpest Formolized Vaccine.**]—*Rev. Gén. Méd. Vét.* 1929. Apr. 15. Vol. 38. No. 448. pp. 201–206.

It would appear that in the case of a number of diseases caused by filterable viruses valuable vaccines can be prepared by treating spleen pulp with formalin. Whether this is because that organ is specially rich in the virus or because it has some special action is not known, but it is certain that other virulent materials such as blood or peritoneal washings when treated with formalin are uncertain in their immunizing power, and far larger doses have to be given.

A series of experiments carried out during the last two years appears to the authors to warrant the introduction of the method into field work, and they express the hope that others who may have to deal with rinderpest will give the method a trial, and so gather data. They believe that the method is less risky than the serum treatment [They do not indicate the serum simultaneous method here.] and more economical.

The vaccine is prepared as follows: Spleens are removed from calves which are virus donors for hyperimmunization of serum-producers. They are minced and ground up in a Latapie apparatus with normal saline containing 2 per 1,000 formalin. The mixture is diluted until 5 cc. corresponds to 1 gramme of spleen substance. The mixture is kept at room temperature protected from light. Experiments have been carried out with the whole formolized mixture and also with the liquid obtained by centrifuging. Eight calves were injected with doses of formolized spleen ranging from 100 g. to 2 g, after 48 hours of formolization. Twelve days later they were given 5 cc. of virulent blood. Five gramme doses were found to protect. Stored vaccine gradually diminishes in potency. After 18 days 5 grammes failed to protect, but 10 grammes established immunity. A similar result was obtained after 47 days storage. After 76 days a dose of 5 grammes again conferred immunity and it would appear that

this is about the minimum dose which can be employed, and that the results obtained at 18 and 47 days were due to individual susceptibility rather than to loss of potency of the vaccine. No figures are given to show the number of animals used in these tests at intervals.

It appears to be certain that the vaccine retains its potency sufficiently long to allow of it being sent out into the field. A difficulty experienced by the authors was the production in quantity. The spleens of the young calves used as virus producers weighed only about 200 grammes—or sufficient for 40 animals. [The dose is therefore 5 grammes of spleen substance, or 25 cc. of the suspension.] Recourse was therefore had to the use of spleens of animals naturally attacked in the field. A spleen was sent from the field to Bamako wrapped in sterile cloth and placed in formolized saline. It reached the laboratory in 12 days. The vaccine was prepared and it was used on the 16th and the 28th days. Four calves received 10 grammes of spleen substance. They were tested respectively 12, 15, 18 and 23 days later, and were found to be immune. The authors suggest, therefore, that utilizing the spleens of naturally attacked animals, the vaccine could be prepared at the scene of an outbreak, but they have not yet tested this.

Fearing that prolonged contact with formalin might be a cause of decline in potency the authors attempted to free the emulsion from it. They noted that in wide-mouthed vessels plugged with wool the odour of formalin disappeared after a time, but tests showed that there were traces of aldehyde left. A long time was required for this. It was observed that having left aside quantities of the complete mixture, and also of the supernatant liquid obtained by centrifuging, the latter became covered with moulds while the former remained free. It was thought that the reason might be that the formalin was fixed to the cells of the spleen. They decided to experiment with the liquid free, as they thought, from formalin. Subsequent tests showed that the liquid contained as much formalin as the mixture.

The emulsion was centrifuged for 5 minutes at 5,000. The liquid so obtained was turbid and deposited a layer of cells after standing for a few days. These were readily redistributed by shaking.

Eight calves were injected with doses of this liquid ranging from 20 to 50 cc. after contact with the formalin for periods ranging from 40 hours to 76 days. Twelve days later they were tested with virulent blood as before. 20 cc. was found to be an effective dose, and there was little or no difference in the results whatever the period of contact with the formalin. The liquid is easier to handle than the whole mixture and more readily injected. Latterly, the authors have used the liquid obtained by leaving the emulsion to stand in the dark, without centrifuging, and the mixture has been made so that 20 cc. is equivalent to 5 grammes. Calves vaccinated since 1926 have all been kept under observation, with the exception of two, which were used for other purposes. They have all been in permanent contact with virus producers at the laboratory itself or on the farm, where all the animals are sero-vaccinated. Not one has contracted rinderpest. Their immunity has been verified by injections of 10 cc. of virulent blood. There is a possibility that the immunity is due to the virulent blood used for the test inoculation after immunization, and if this were actually the case it would entail two interventions in field operations. This would be quite impracticable. The authors hold that experiments prove that the formolized spleen has actually acted as a vaccine for the

following reasons. The contact between the spleen pulp and the formalin must be of a certain duration. Experiments after contact of 1, 4 and 8 hours have given negative results. The vaccinating power does not therefore reside in some pre-existing substances. Following the injection of formolized pulp a minimal period of 10 days is required for the establishment of immunity.

Animals may be tested with virulent blood at intervals far greater than 15 days after vaccination. Animals injected with virulent blood on the 64th day have given no reaction.

McKinley (E. B.). **Experimental Rinderpest in Goats.**—*Proc. Soc. Exp. Biol. & Med.* 1928. Oct. Vol. 26. No. 1. pp. 22–24.

Goats, which in the Philippines are less expensive than rabbits, can be used for rinderpest experiments. The mortality from infection is low, but nevertheless the disease runs a definite course. There is a gradual rise of temperature to 40·2° or more by the 5th or 6th day. Diarrhoea sets in and persists while the temperature gradually drops to normal. There is marked loss of appetite and condition, and occasionally death occurs. As a rule, however, goats recover. Highly diluted virus can be used. 2 cc. of a 1/10,000 dilution of infective carabao blood will cause a typical reaction. The same dilution produced a delayed reaction in Davao cattle which are considered to be more resistant than carabaos.

Recovery leads to immunity. The serum of such animals was not found to be destructive to the virus in carabao blood in test tube experiments. The mixtures used were 1 cc. of the virus to 4 cc. of recovered goat serum at room temperature for 24 hours. Similar results were obtained when the mixtures were incubated at 37° C. for 6 hours.

Rabbits were injected intravenously with 20 cc. of rinderpest infected carabao blood, and 24 hours later were bled from the heart. This blood injected immediately into goats failed to set up the disease.

Curasson (G.) & Delpy (L.). Le vaccin formolé contre la peste bovine. [**Formolized Vaccine against Rinderpest.**]—*Bull. Acad. Vét. France.* 1929. Feb. Vol. 2. pp. 87–92.

This paper appears in another journal and has been abstracted.

Plantureux (E.). Sur la vaccination préventive des chiens et la prophylaxie de la rage. [**Protective Inoculation of Dogs, and Prophylaxis against Rabies.**]. *Rév. Vét. et Jl. Méd. Vét.* 1929. Aug. Vol. 81. pp. 409–419.

Protective inoculation of dogs against rabies has to a great extent established its value, and the service which the prophylaxis may render appears to be beyond doubt.

It is obligatory in Japan, Cuba, Portugal, and in certain large towns in Italy and California. It has been widely applied in the United States. France, the cradle of antirabic vaccination, will soon be one of the few countries where advantage has not been taken of the benefits that

vaccination confers. It cannot be denied that the sanitary police measures are unsatisfactory. Apart from official inertia the failure to put the regulations into force is due to the fact that slaughter of dogs bitten and all in contact is the principal safeguard. There is always a tendency for persons to try to save their animals, and the severity with which the law is enforced varies from place to place and from time to time. The author does not think it would be possible to modify the procedure in any way without actual alteration of the law, because it would involve a complete change in the point of view of the majority of the people. Vaccination could render valuable aid in the control of the disease.

The original method of Pasteur is not applicable because of the number of injections required, and because the vaccine cannot be sent great distances.

During recent years investigation has led to the production of at least three forms of vaccine: the glycerin-carbolized vaccine of Japan, Remlinger's ether virus, and the author's formolized vaccine. The first two of these employ an attenuated vaccine. In Plantureux's method the virus is killed by 4 per 1,000 formalin, and therefore there is no risk of causing the disease. Further, the vaccine is freed from the soluble toxic substances of the rabic brain tissue and consequently it is absolutely harmless, and it would appear that there is no reason to fear the development of paralytic symptoms.

The author has given 100–150 cc. of vaccine at a single dose to rabbits without producing the slightest ill-effect. The dose for a dog of medium size is 20 cc. Four sheep were inoculated every three weeks for a year with 200–300 cc. without any disturbance of health. Between each inoculation 800 cc. of blood were withdrawn for the preparation of anti-rabic serum. In all, apart from rabbits, about 300 animals (dogs, goats, sheep) have had the vaccine injected either before or after infection, and in no instance has there been any disturbance of of health.

In actual practice 500 dogs have been vaccinated. An important point in connexion with the formolized vaccine is that it is stable. At room temperature it retains its entire properties for three months or more, and in an ice chest (+10° C.) it is quite fully serviceable up to 8 months or more. The vaccine can be used for the inoculation of herbivora after they have been bitten.

The preparation of the vaccine is simple. The brain of an animal dead of fixed virus is ground in a Latapie with normal saline containing 4 per 1,000 formol. It is important to note that the author specifies that the formol (formalin) used is 25 per cent. formaldehyde (not the 40 per cent. used in this country). The coarse particles are strained off and the emulsion is left for 5 to 8 days at 10 to 15° C., and then centrifuged and the sediment is emulsified in nine parts of normal saline containing 1 per 7,500 sunoxol. The sunoxol is added to prevent the development of moulds. The amount of formalin present is sufficient to prevent bacterial growth.

Two inoculations are necessary and it is recommended that as long an interval as possible—3 weeks—be left between the injections.

On account of the facts elicited by RAMON in his work on anatoxins it was thought possible that after vaccination another injection at the end of a year would result in the establishment of a solid immunity. Experiment has shown this to be the case. The animals resisted intra-ocular inoculation with street virus.

REMLINGER (P.) & BAILLY (J.). La vaccination antirabique du chien au Maroc. [**Antirabic Vaccination of the Dog in Morocco.**]—*Rev. Gén. Méd. Vét.* 1929. Apr. 15. Vol. 38. No. 448. pp. 193–200.

The authors have used the ether virus devised by Remlinger.

Briefly, the technique of preparation is as follows: The brains of three rabbits dead of fixed virus (the brains are obtained from the antirabies institutes which utilize only the spinal cords) are placed in vessels containing sulphuric ether, several layers of blotting paper or muslin having been placed at the bottom. This allows the ether to come into contact with all parts of the brain. The periods of immersion are 25 hours for 1st vaccine, 20 hours for the 2nd, and 15 for the 3rd. The immersion causes considerable shrinkage, and the tissue acquires a dark grey colour. These changes are due to the extraction of a considerable amount of fatty material which forms a heavy layer at the bottom of the vessel. The brain tissue thus treated is very friable and can readily be made into emulsions with watery liquids. Such emulsions are more readily injected and absorbed than those prepared from fresh nerve tissue. The three vaccines are injected at intervals of 24 hours. When the vaccines are to be used at a distance the normal saline used for emulsification is replaced by 50 per cent. glycerine or saline containing 1 in 1,800 formalin. In summer, the vaccines remain usable for 6 or 7 days, and up to 10 days in winter. The injections are given subcutaneously at any place where there is a large amount of loose connective tissue. Dogs may be vaccinated at any age, but it is preferable to wait until they are 8 to 10 months old. Pregnancy and lactation are not affected by the vaccination. Up to January, 1929, 234 dogs which had not been bitten had been vaccinated, and 30 after having been bitten by rabid or suspected animals. The large figure for vaccinations after having been bitten is explained by the fact that in Tangier there are no laws concerning the control of contagious diseases of animals; the authors therefore had a free hand. All the dogs vaccinated have been kept under observation for periods ranging from 3 to 20 months. None of those vaccinated after having been bitten contracted rabies, and there were no accidents of any kind among those which had not been bitten. It is probable that paralysis following anti-rabic vaccination is of more rare occurrence in dogs than in man, but it would appear that the ether virus does not tend to produce these results.

The ether virus is not toxic, and the probable explanation of this is that the ether removes the injurious lipoids from the nerve tissue. It was decided by the International Conference on Rabies that the vaccination of dogs should be carried out with a dead virus or with a fixed virus which was not pathogenic for the dog by subcutaneous or by intramuscular inoculation. It was pointed out at that Conference that it is a law of general pathology that attenuated viruses produce a more solid immunity and with greater rapidity than dead viruses. On theoretical grounds there might be some fear that the saliva of vaccinated dogs might contain the virus, but experimental inoculations of guineapigs have failed to furnish any evidence that this is so.

The virus-ether vaccine owes its high immunizing power not only to the use of living vaccine, but also to the fact that a considerable quantity (120 cc.) of brain emulsion is injected. Each of the three brains used is emulsified in 40 cc., and this is divided into 2 quantities for injection.

It is true that the Conference recommended that, if possible, vaccination should be effected by a single injection. It would appear that the middle path between the old Pasteurian method and the method of Högyes and the single injection advocated is the 3-injection method. It is not suggested that the method is not capable of modification, but for the time being until the duration of the immunity conferred has been ascertained it is thought preferable to err on the side of giving a larger dose of vaccine than may subsequently prove to be necessary. For similar reasons the authors recommend annual vaccination with a brain kept for 15 days in ether and emulsified in 40 cc., but possibly the interval may be more prolonged in future. The authors believe that the vaccination is of more value from the economic and possibly sentimental points of view than from the point of view of sanitary police control, because there will always be far more unvaccinated dogs than vaccinated ones, apart from the question of wild animals affected with the disease. Police dogs, sheep dogs, watch dogs, hounds, etc., will be the dogs protected. Such animals are under proper control, as also are pet animals.

DE GEORGES (L.). Valeur de la barrière hémato-encéphalique dans l'immunisation contre la rage. [**The Value of the Haemato-Cephalic Barrier in Immunization against Rabies.**—*Rev. Microbiol., Epidémiol. et Parasitol.* 1928. Vol. 7. No. 4. p. 457. [Author's French abstract.]

By injecting rabbits intravenously with 2 per cent. solution of carbolic acid or with 25 per cent. alcohol prior to injecting rabies vaccine in order to decrease the effectivity of the haemato-cephalic barrier the author found that the immunizing power of the vaccine was increased about two and a-half times.

SMITH (E. C.). **Canine Rabies in Nigeria.**—*West African Med. Jl. Lagos.* 1928. Oct. Vol. 2. No. 2. pp. 120–125.

Six cases of canine rabies have been notified during 1928. Five of these were investigated at some length, and rabbits were inoculated successfully from one of them. The author gives an account of the clinical manifestations of the disease abstracted from KOLLE and WASSERMANN. He adds that his experience would lead him to designate intermittent or continuous panting, suffusion of the eyes, and pawing the mouth as being of importance. The animals, 3 in number, which came under observation showed no fear of water but attempted to drink. The important point in this connexion is the appearance of spasms when drinking is attempted. The altered or depraved appetite was marked. In two of the cases the tendency to hide was pronounced. It was difficult to assess the value of the tendency to bite animate and inanimate objects because it is a common habit of young native dogs.

Two varieties of spasms were noted. In one case the biting spasms were pronounced; the animal would bite at anything placed within reach, and the spasm would then cease abruptly, the animal lying down exhausted. In a few moments it would be repeated. The abdominal spasms may have a definite relationship to the taking of food or water or they may occur independently. Contractions of the abdominal muscles usher in the attack; they resemble those seen in normal animals following the ingestion of grass, and are followed by a violent expiratory effort leading to the expulsion of a little frothy blood- or bile-stained mucus and are accompanied by a peculiar barking sound similar to a grossly exaggerated "whoop" of pertussis. Panting, with a lolling of the tongue was a marked feature of two of the cases observed, and it was noted that the tongue was dry and of a brick-red or brownish tint. The eyes were suffused and had a staring look. In one animal there was a squint and in another upward and outward rotation of both eyeballs occurred. There was either no reaction or very sluggish response of the iris to light. There was no photophobia.

In three dogs the symptom was observed of the animal using its paws as if attempting to dislodge some object from between its teeth. Burying the nose in the ground, or pushing it against a wall were also symptoms observed.

The author gives full details of four cases. The appearances found at post-mortem may be disappointing. Even cerebral congestion may be scarcely noticeable. In all the cases dried scabs of mucus were found obstructing the nostrils. Congestion of the peritoneum and inflammation of the mucous membrane of the stomach were found in all cases. The author is of the opinion that the condition of the stomach and its contents cannot be taken as an infallible indication of rabies or otherwise. An empty stomach may mean either that paralysis of the jaw set in early or that vomition occurred just prior to death. It is, however, of value when either foreign bodies or a normal meal is found.

Although the author says at one place that cerebral congestion may be scarcely noticeable, he states that congestion of the meningeal vessels was present in all the cases. In one instance the sulci were distended and obliterated with extravasated blood. In all four cases there was distinct softening of the brain tissue. Congestion of the superficial vessels was constant, and flame-shaped extravasations were present in one case.

The author found that 10 per cent. formalin was quite satisfactory as a fixative with regard to the detection of negri bodies, but he recommends that more than one method of staining be resorted to. Good results were obtained by brief staining with haematoxylin followed by alcoholic eosin. Loeffler's methylene blue for ten minutes with decolorization in 1 per cent. tannic acid also gave good results. Giemsa gave uncertain results, but when successful the results were particularly good. Goodpasture's method was uncertain with the formalin fixed tissues.

Intra-cerebral inoculations into rabbits were carried out with material from three of the brains, but positive results were obtained with only one. In this case the virus was carried on in series up to the fourth generation. Negri bodies were found in all the rabbit brains. It was noted that in all cases there was marked dilatation of the vessels of the ears of the rabbits one or two days before death took place.

TRAUTWEIN (K.). Die Resistenz des Maul- und Klauenseuchevirus gegenüber den Strahlen der Quarzlampe, des Sonnenlichts und der Solluxlampe, sowie der Einfluss der Bestrahlung auf den Ablauf der Maul- und Klauenseucheinfektion beim Meerschweinchen. [**The Resistance of the Virus of Foot-and-Mouth Disease to the Rays of the Quartzlamp, Sunlight, and Sollux Lamp, and the Effect of Irradiation upon the Course of the Disease in Guineapigs.**] —*Arch. f. Wissensch. u. Prakt. Tierheilk.* 1929. Aug. 22. Vol. 60. No. 2. pp. 101–110.

Ultra-violet light is destructive to the virus of foot-and-mouth disease. The rate of destruction, other things being constant, depends upon the concentration of the virus in the substrate. Lymph virus in a 1 in 50 dilution or dried was destroyed in 5 to 60 minutes, but concentrated guineapig lymph or epithelial shreds from guineapig lesions were still infective in most cases after an exposure of 60 minutes.

Exposure to sunlight during August proved fatal to the virus, but the shortest period of exposure which proved effective was 2½ hours.

The incandescent lamp (small sollux lamp) only killed the virus exceptionally in 1–2 hours. Irradiation was apparently without effect upon the course of the disease in guineapigs.

CIUCA (A.). **The Reaction of Complement Fixation in Foot-and-Mouth Disease as a means of identifying the Different Types of Virus.**—*Jl. of Hygiene.* 1929. Feb. Vol. 28. No. 4. pp. 325–339.

Although a considerable number of investigations have been carried out with a view to determine whether any complement fixation test can be carried out satisfactorily in the case of foot-and-mouth disease, the results have for the most part proved negative.

The author, working at the Lister Institute, London, has carried out investigations with a view to providing answers to the following questions :—

(1) Are sensitizing antibodies to be found in the blood of animals infected or hyperimmunized against each of the three known types of virus ?

(2) If found, when do they appear and for how long do they remain?

(3) Are these sensitizers specific ?

(4) Can the types of virus be identified in vitro by means of the test?

Details are given of the technique employed and of a large number of tests carried out, and from the results of the latter the following conclusions are drawn.

A very sensitive antigen can be prepared by the septic maceration of the pads of guineapigs 24 hours after infection. This antigen is strictly specific and fixes complement only in the presence of antibodies for the homologous type of virus. Such antibodies can be identified in the serum of guineapigs which have recovered from infection or have been hyperimmunized. Vesicle fluid diluted 1 in 10 is an active antigen when used with homologous antibodies, but at 1 in 50 it is less reliable. With all three types of virus antibodies increase in the serum of recovered guineapigs up till about the 21st day. They persist for about 8 weeks at a practically constant level, and can no longer be detected at 10 weeks

In animals hyperimmunized by the intradermal route antibodies can be detected in every case for about 20 weeks. By the intramuscular route the detection is effective in 99 per cent. of cases, and when hyperimmunization has been carried out by the subcutaneous route in about 70 per cent. of cases.

WARD (H. K.) & FEI-FANG TANG. **A Note on the Filtration of the Virus of Herpetic Encephalitis and of Vaccinia.**—*Jl. Experim. Med.* 1929. Jan. 1. Vol. 49. No. 1. pp. 1–4.

The authors publish this note in the hope that it will help in the study of filtrable viruses in general, and for this reason it is abstracted here.

It has been a common experience that saline suspensions of infective brain tissue may fail to yield virulent filtrates after passage through a Berkefeld V. filter, and this uncertainty has been a hindrance to the study of the disease. It is well known that saline emulsions containing the virus rapidly become inactive when exposed to the air, and the authors thought that filtration under anaerobic conditions might overcome this difficulty. They found, however, that this was not the case.

Working on the lines suggested by BRONFENBRENNER regarding the filtration of bacteriophage the authors tried the anaerobic filtration of an emulsion of brain in hormone broth after centrifuging, an ordinary aerobic filtration being carried out at the same time. Both filtrates were infective and the anaerobic filtrate kept in an atmosphere of hydrogen remained infective for at least 8 days. Longer periods have not yet been tested.

To get constant results in filtration experiments the following technique is to be followed. The brain of a rabbit dead (or showing typical symptoms) is removed and 5 grammes are ground in a mortar with sand. Hormone broth is gradually added with constant grinding until 100 cc. have been added. The emulsion is then centrifuged for 30 minutes at 2,000. The supernatant liquid is poured off and a few drops of culture of *B. prodigiosus* added.

Berkefeld V filters are washed through successively with 1 per cent. potassium permanganate, 5 per cent. sodium bisulphite and about a litre of distilled water. They are then tested and only those are used which give 45 to 60 cc. of distilled water in 5 minutes at a negative pressure of 10 mm. of mercury. (It is not stated what size filters are used.) The filters are autoclaved. *B. prodigiosus* is added to the emulsion to be filtered. In one experiment Berkefeld N, Chamberland L_2, Seitz E. K., and Mandler regular filters were tested. Mandler was the only filter to allow the virus to pass. In another the virus passed through Berkefeld N.

1 cc. of filtrate is used to inoculate blood broth which is incubated for several days to test for *prodigiosus*. The authors have found that growth sometimes develops after 48 hours or more, and they have found quite a number of Berkefeld V filters pass this organism. 0·5 cc. of filtrate is used for the intracerebral inoculation of a rabbit. In positive cases the temperature rises on the 3rd or 4th day and death takes place on the 4th to 7th day with the exhibition of the usual symptoms.

Parallel experiments with vaccinia virus show that it, too, can be filtered by this technique, but there is evidence that only a comparatively small fraction of the virus passes through as shown by inoculation tests.

It is of practical as well as theoretical importance that the filtrate remains active for 6 weeks or more when stored in an ice chest, whether it is in an open tube, sealed with vaseline or diluted with an equal amount of glycerol.

If the scrapings are kept on ice for 2–3 days before emulsification the filtrate is not infective, and further, if scrapings are kept in 50 per cent. glycerol broth (1 of scrapings to 4 of broth) on ice before making the 5 per cent. emulsion in broth the filtrate is inactive.

BLANC (G.), MÉLANIDI (C.) & STYLIANOPOULO (M.). La variole des chèvres en Grèce. [**Variola of Goats in Greece.**]—*Arch. Inst. Pasteur Hellénique.* 1928. Vol. 2. No. 1. pp. 129–133. With 3 plates.

The absence of herds of goats of any size in Western Europe is responsible for the small amount of attention that has been paid to variola in this species, and there is in consequence some difference of opinion regarding the nature of the disease. It appears to be a fact that more than one disease has been described as variola in goats. For example, the stomatitis of goats described by ZELLER in East Africa should be distinguished from true variola—a distinction which some authors do not make.

Goat pox appears to have appeared for the first time during the war in Macedonia, where its spread was checked.

It reappeared in 1926 and shortly afterwards spread as an epizootic. In herds comprising sheep and goats only the latter were affected, and a period of 3 to 5 months is required for the passage of the disease through a herd. The mortality ranges from 5 to 15 per cent. The course run by the disease is practically parallel with that of sheep pox.

The authors have never observed lesions in the mouth, but in some cases they occur in the nasal cavities, the larynx and trachea. In such instances there may be severe catarrh followed by serious pulmonary complications. Unilateral and bilateral keratitis has been observed. When death occurs it is usually attributable to complications and not to the disease itself.

The authors' experiments lead them to conclude that variola in the goats is a distinct entity, and is quite different from vaccinia, sheep pox, and ovine stomatitis. It does not appear to be transmissible to either man or the sheep.

KLIGLER (I. J.), MUCKENFUSS (R. S.) & RIVERS (T. M.). **Transmission of Fowl-Pox by Mosquitoes.**—*Proc. Soc. Exp. Biol. & Med.* 1928. Nov. Vol. 26. No. 2. pp. 128–129.

The mode of transmission of certain virus diseases of chickens is still obscure. Many workers have reported that attempts to infect birds with fowl pox and fowl plague by contact or by ingestion of infected food-stuffs usually fail. The experiments carried out by the authors in the United States were concerned with fowl pox, as fowl plague is not prevalent. Using Culex and Aëdes mosquitoes it was possible to transfer the disease from infected to healthy fowls with considerable

regularity by interrupting the mosquitoes after they began feeding on lesions of diseased birds and allowing them to complete their meal in the comb or wattles of healthy ones. Even when an interval of two hours elapsed between the meals successful results were obtained. The lesions appeared on the birds about 7 days after the mosquitoes had fed.

In one experiment transmission was obtained under conditions approximating to those occurring in nature. Two healthy chickens were placed in a mosquito-proof box with a diseased one. Four freshly hatched Culex mosquitoes were released in the box. After seven days two typical discrete lesions appeared on the wattles of one of the healthy birds. In a control group without mosquitoes none of the birds showed any evidence of infection after 17 days.

MISCELLANEOUS.

WOODFORD (R. C.). **Some Facts regarding a Flock of South Indian Sheep.**—*Jl. Central Bureau Animal Husbandry & Dairying in India.* Calcutta. 1929. Apr. Vol. 3. Pt. 1. pp. 25–31.

From the purely veterinary point of view the interest of this paper lies in a statement made in connexion with "Health" (p. 26).

"Mortality in lambs has been as high as 40 per cent. (the average crop is 90·9 lambs per 100 ewes over a period of 2 years), and as low as 2 per cent; of recent years 8 per cent. is the average. . . Blackquarter has passed them by three times, and during a severe outbreak of rinderpest this year, among the two to three year old cattle (inoculated as calves by the serum simultaneous method), only two sheep contracted the disease before all were inoculated, though they must have been exposed to infection for some time."

STÉVENEL (L.). Le principe actif de l'huile de Chaulmoogra. [**The Active Principal of Chaulmoogra Oil.**]—*Bull. Soc. Path. Exot.* 1929. May 8. Vol. 22. No. 5. pp. 338–341.

It is recognized by medical men who have used chaulmoogra oil for the treatment of leprosy that old samples which have a pronounced colour are therapeutically more active than fresh specimens which have only a slight colouration, and for this reason it has been suspected that the value of the oil may lie rather in impurities present in it than in the oil itself.

The author has been investigating the toxicity of chaulmoogra oil for some time, and during 1924 and 1925 he ceased working with commercial samples which varied greatly in purity and toxicity, and began examining the seeds themselves for the purpose of ascertaining which part was the most toxic.

Seeds of *Hydnocarpus wightiana* were very carefully decorticated by hand and then pulped and extracted with pure benzol. The practically colourless limpid oil so obtained was absolutely non-toxic for frogs. Commerical samples were toxic in 0·5 cc. doses into the anterior lymphatic sac. The albumins extracted from the residue by saline solution were also non-toxic, and the residue itself was non-toxic. It therefore appeared that the toxic principle lay in the hard outer skin. An alcoholic extract of this proved very toxic, but assessment was

difficult because of the alcohol which had to be employed as a solvent. An ether extract was then made of the alcohol extract, another was dissolved in the oil. This proved to be extremely toxic. A search was made for alkaloids in the skins, but none could be found, but it was established that a chloroform or an ether extract dried from the skins was very toxic indeed.

Experiments carried out in cases of leprosy with ether or chloroform extracts of the skins in pure olive oil injected intra-muscularly showed that there was a very marked therapeutic effect. The seeds used were *Hydnocarpus wightiana*, *H. anthelmintica*, and *H. saigonense*. The last of these, which has a very thin skin, were non-toxic for lizards and had no therapeutic effect.

Chemical examination showed that the toxic principle of chaulmoogra (and the therapeutic principle) is a kind of phytostearin, which is readily soluble in fatty substances. It is therefore recommended that the entire seeds should be extracted including the shells after the pulp of the fruit has been removed. This latter contains a cyanogenetic glucoside.

KENGKRASAT (Samit). Les maladies infectieuses les plus communes des animaux domestiques au Siam. [**The Most Commonly Occurring Infectious Diseases of Domestic Animals in Siam.**]—*Rec. Méd. Vét. Exot.* 1929. Jan.–March. Vol. 2. pp. 5–9.

The whole of Eastern Siam is a low plain which is subject to inundation. These conditions favour the spread of diseases caused by organisms capable of maintaining themselves in the soil.

Anthrax is of constant occurrence in all parts of the country. It is especially prevalent after the rains. While all species of animals are susceptible the majority of cases occur in the horse and elephant.

Special attention is drawn to the frequent occurrence of so-called "external anthrax" which is characterized by the formation of tumour-like swellings on various parts of the body. In this form the disease runs a slow course (3–8 days) and recovery is not exceptional. In elephants the only symptoms of anthrax may be dullness and depression and the presence of hot painful swellings.

The spread of anthrax has been favoured by skinning carcases and the use of the meat after salting. Carcases not fit for use and entrails have been left exposed on river and canal banks.

More recently sanitary legislation has been introduced for the control of the disposal of carcases, and the regulations are applied as closely as possible. A stumbling block in the way of control is the occurrence of anthrax among wild animals with distribution of parts of the carcases by scavenging animals and birds.

Anti-anthrax vaccination is a valuable adjuvant in the control of the disease among domesticated animals and vaccination is compulsory when a case occurs. On Government farms annual vaccination is carried out. The vaccine is prepared at the Pasteur Institute, Bangkok. Cases of anthrax in man are very rare.

Surra occurs in Siam principally in the horse, but it also attacks cattle, buffaloes, elephants, goats, sheep, pigs and dogs. The usual preventive measures are put into force to limit the disease in the mounted branches of the troops. "Bayer 205" and "Fourneau 309" have been used medicinally for the last two years.

Cattle plague is endemic and is particularly prevalent after the hot weather and after the monsoon. Serum is used as a prophylactic, and in large doses as a curative. No mention is made of any method of active immunization.

Rabies occurs principally in the dog, but it is seen fairly frequently in the ox, buffalo, and horse. It is very often transmitted to man. The disease is under better control than it was formerly because the people have gradually been educated to catch stray dogs and kill them. This is contrary to the tenets of Buddhism. Taxation on dogs has also had a beneficial effect. In spite of this, however, between four and five hundred people are treated annually at the Bangkok Pasteur Institute with a mortality of 0·3 to 0·4 per cent.

BOOK REVIEWS.

GEROSA (Giuseppe) & MIRRI (Adelmo). **La sterilità degli animali domestici. (Eziologia—Diagnosi—Profilassi e Cura).** [Sterility in Domestic Animals. (Etiology, Diagnosis, Prophylaxis and Cure).]—pp. v+246. With 53 text figs. & 32 figs. on 14 plates (2 coloured). 1929. Pubblicato a cura dell' Istituto Sieroterapico Milanese. [L.20.]

This manual has been compiled on the suggestion of Professor STAZZI, a pioneer worker on the problem of sterility in domestic animals in Italy, and it has been published by the Sero-Therapeutic Institute, Milan. The authors, who are on the staff of the Royal Institute of Veterinary Medicine at Milan, are also veterinary surgeons of wide practical experience.

The main portion of the book is divided into eleven parts under the following general headings: Description of the male and female genital apparatus from the anatomical and physiological standpoints—Examination of the internal genital organs of the female—Diagnosis of pregnancy (with special reference to the cow and the mare)—Sterility in general—Sterility in the male and in the female—Relation between certain diseases in the female and sterility in the female—Nutrition and sterility—Prophylactic measures—Sterility in pigs and in sheep and goats. There is also an appendix of two pages on artificial insemination and a bibliography of books and papers consulted.

For anyone wishing to obtain at a brief glance a rough working idea of the commoner abnormal and diseased conditions which give rise to sterility in the domestic animals, and particularly in cattle, the book might be useful. It is stated to be intended for the use of students and practising veterinary surgeons. Judged from the standpoint of the general practitioner, a useful feature of the book is the inclusion of notes on the normal physiological functioning and the anatomy of those parts the diseases and abnormal conditions of which are dealt with in the various sections on pathology. These notes should serve the double purpose of refreshing the practitioner's knowledge of the details which are so liable to be forgotten in the course of a busy practice, and also of providing him with up-to-date general information on his subject.

The proportion of space allotted to some of the subjects is disappointing, as for example, sterility in the male, which unfortunately receives scant treatment, occupying a mere 10 pages as compared with over 140 pages devoted to sterility in the female. Although it would not be disputed that sterility is more frequently due to abnormal or pathological conditions in the female, yet it appears to the reviewer that more space should have been

devoted to those conditions in the male which are responsible for inability to breed. Similarly, the total, eight pages, given to sterility in pigs, sheep and goats seems inadequate.

Though not alphabetically arranged the index is full and well grouped and should be useful to any reader with a general knowledge of veterinary science. The plates and illustrations are on the whole crude and many are poor : and the paper and binding are of inferior quality, but one must remember that Italian standards in such matters are somewhat lower, and the price (20 liras) is moderate.

F. A. E. Crew.

REID (H. A.) [Lt.-Col., O.B.E., F.R.C.V.S., D.V.H., F.R.S.E.]. **The Use of Iodine and its Compounds in Veterinary Practice.**—88 pp. 1929. London : De Gruchy & Co., Ltd., 45 Mitchell Street. [3s. 6d.]

This book comprises 78 pages of text, and is a somewhat extensive accumulation of data regarding the value and use of iodine and its compounds in the prevention and cure of diseases of the domestic animals and poultry. Eighty-nine authorities are quoted.

Chapters are devoted to the use of iodine externally ; internally ; in the prevention and treatment of specific and general diseases and diseases of undetermined origin ; as a parasiticide ; and finally, the influence of iodine on nutrition, reproduction and disease resistance.

A number of interesting sheep and pig feeding experiments are quoted, both from this country and America, in which it is shown that the inclusion of small doses of potassium iodide in the diet encourages rapid growth and early maturity. There is also some evidence, although as yet not conclusive, that fertility is increased. In goitrous districts in which the pastures and drinking water are deficient in iodine very marked improvement in condition and fertility of stock attends the inclusion, in the diet, of iodides.

Dealing with specific and general diseases, Col. Reid's book serves to remind us of the work which has been done and the good results obtained by the use of iodine in the treatment of such conditions as actinomycosis, equine influenza, strangles and pneumonia, purpura haemorrhagica, endometritis and sterility in cattle.

Quoting experiments carried at the Storr's Agricultural Experimental Station, Connecticut, good results are reported to have attended the use of iodine in the form of Lugol's solution in the treatment of parasitic gastritis in sheep. Similar treatment might well be given a trial in young cattle and sheep in this country.

As a prophylactic, Col. Reid produces a little evidence to show that the use of potassium iodide reduces the incidence of joint-ill in foals ; and in dealing with contagious abortion tends to discredit the use of live vaccines of *Br. abortus*, and recommends that an extended trial be given to potassium iodide as a prophylactic, based, not upon any definite evidence, but upon reports which support the view that iodine influences favourably infective processes of the most virulent types.

Under the heading " Diseases of undetermined origin," the writer deals with such conditions as grass sickness, braxy, scrapie. Referring to grass sickness is the following :—

" The actual cause of Grass Sickness has not up to the present been determined, though it seems obvious that it must have a dietetic origin, arising probably from a defective mineral balance in the constituents of the food consumed, which, in turn, may depend upon the lack of available mineral matter in the soil. Long continued grazing is known to exhaust the iodine content of the soil, and, in these circumstances, the element will be proportionately deficient in the herbage. Iodine, as we have seen, not only stimulates the protective mechanism of the body against infections

of all kinds, but also favourably influences metabolic activity by helping to conserve the nitrogen and phosphorus supplies, and securing an increased retention of calcium."

Arguing on the analogy of the last sentence, iodine becomes the "sine qua non" of all treatment. Col. Reid refers to it again and again. He applies it to milk fever, and suggests that in view of the deduction of DRYERRE and GRIEG that milk fever is the result of a fall in blood Ca. iodine should be given as a prophylactic to conserve the body calcium. He applies it to tuberculosis in view of the fact that Dr. J. B. ORR has stated that there is evidence for believing that the high incidence of tuberculosis in good milking cows is associated with prolonged losses of calcium due to the excessive secretion of milk.

In both braxy and scrapie, in view of their localized nature, the author suggests that deficiency in minerals, including iodine, may feature as a basis of these troubles.

The book contains a lot which is controversial; if Col. Reid is right, iodine has an unlimited field of usefulness in therapeutics. It is recommended that it be widely read, and some of its suggestions at least given a trial.

John G. Wright.

EWING (Henry Ellsworth) [United States Bureau of Entomology]. **A Manual of External Parasites.**—pp. xiv+225. With 96 text figs. 1929. London: Baillière, Tindall & Cox: 7 & 8, Henrietta Street, Covent Garden, W.C. 2. [20s.]

In this book of 225 pages, attractively bound in red cloth, Mr. Ewing deals with five large groups of external parasites of animals: Parasitic mites, ticks, biting lice, sucking lice, and fleas.

Keys are given to all the genera which, with the aid of a few short supplementary descriptions and illustrations, will aid those who already have some knowledge of the subject in tracking down a parasite to its genus. The work is divided into five chapters treating with the different groups of parasites according to their systematic position. Each chapter begins with a short account of the external anatomy, type of life history, and probable origin and relationships of the groups. Then follows the classification, with keys to families, sub-families and genera, a short list of synonyms, and supplementary descriptions to some of the genera; this occupies the greater part of the chapter, which is completed with a short account of methods of control, and references to some of the most important papers dealing with the group. An appendix appears at the end of the book in which descriptions of thirty-one proposed new genera are given.

For a short treatise of this kind, the author has rearranged and subdivided the genera with rather a free hand, and his inclusion of so many proposed new genera will doubtless call for some adverse comment from specialists in each group. Taxonomy has evidently appealed most strongly, and some of the other matter seems unfortunately to have received less careful attention. Thus, in the portion dealing with mange mites, one reads that *Chorioptes equi* "lives in colonies on the feet of horses"; that *Psoroptes* "produces a disease known as Scab, which is serious to sheep and cattle." *Sarcoptes* is stated to produce scabies in horses, whereas *Psoroptes* is only mentioned as occurring in these animals. Methods of control are dealt with briefly, as stated in the author's preface, but perhaps a little more thought might have been given to the selection of matter to be included.

Some of the ninety-six figures with which the text is illustrated leave much to be desired, and one wonders where such a wide range is treated in so

little space why room should be given to two old drawings of dipping and spraying appliances, maps of tick distribution, and such photographs as that of American Expeditionary Force " Cootie Clothing."

One feels that this book might have been much better had the author carried a clearer idea of those for whose benefit he wrote, and restricted its appeal to a narrower range of interests. As it is, the novice may lay it aside as too technical for his purpose, while the expert overlooks it as too scant.

E. L. Taylor.

INDEX OF AUTHORS.

A

Ackert, J. E., & C. A. Herrick, 122
Adler, S., & O. Theodor, 78 *bis*
Albiston, H. E., 106
de Almeida, E., 121
Andrjesky, P., with Curasson, 120
de Asua, F. J., R. L. Dios, J. A. Zuccarini, & M. J. Kuhn, 117

B

Bailly, J., with Remlinger, 59, 135
Bakker, S., 124
Balfour, A., 36
Balozet, L., 54
Basset, J., & M. Denizot, 94
Baudet, E. A. R. F., 86
Beattie, J. M., Z. Morcos, & D. Peden, 101
Bekker, J. G., 68
Bennett, S. C. J., 70
& P. A. C. Kenny, 80
Bernard, —, 24
Bevan, Ll. E. W., 90
Biltris, R., 105
Blanc, G., C. Mélanidi, & M. Stylianopoulo, 140
Boshenko, B., & H. Zeiss, 114
Bridré, J., A. Donatien, & D. Hilbert, 65
Broudin, L., 42, 96
Le Louët, & Romary, 43
Brown, H. W., 122
Browning, C. H., J. B. Cohen, S. Ellingworth, & R. Gulbransen, 112
Bugge, G., 83
Burnet, E., & E. Conseil, 126

C

Cadeot, —, 90
Cantaloup, —, 53
Carmichael, J., 25
Carougeaud, —, 83
Carpano, M., 115
Carré, H., 6
Cernaianu, C., 43
Cerutti, C., 48
Ciuca, A., 138
Cocksedge, T. A., 123
Cohen, J. B., with Browning, Ellingworth, & Gulbransen, 112
Conklin, R. R., 33
Conseil, E., with Burnet, 126
Cuillé, J., & E. Darraspen, 117
Curasson, G., 54, 64, 117, 128
& P. Andrjesky, 120
& L. Delpy, 131, 133
Curson, H. H., 2, 15
with Viljoen, & Fourie, 19

D

Darraspen, E., with Cuillé, 117
Das, P. N., 107
Daubney, R., 24
Davis, L. J., 84
Delpy, L., with Curasson, 131, 133
Denizot, M., with Basset, 94
Dieben, C. P. A., 117
Dieulouard, —, 121
Dios, R. L., with de Asua, Zuccarini, & Kuhn, 117
Do-Hun-Khoan, —, with Granouillet, & Nguyen-Tan-Ngoc, 44
Donatien, A., & F. Lestoquard, 78
with Bridré, & Hilbert, 65
with Sergent, Parrot, & Lestoquard, 116
Duncan, J. T., 15

E

Ellingworth, S., with Browning, Cohen, & Gulbransen, 112
Emelin, V., & H. Zeiss, 111

F

Fairley, N. H., & J. S. Penrose, 85
Faure, —, 13, 52
Faust, E. C., 123
Fielding, J. W., 13
Fish, P. A., with Hayden, 34
Forgeot, —, 53
Fornara, L., with Schwetz, 110
Fourie, P. J. J., with Viljoen, & Curson, 19
Freund, S., 116
Futamura, H., 104

G

Galloway, I. A., with Nicolau, 62
Galouzo, I. G., 108
with Oboldouef, 46
de Georges, L., 136
Gerosa, G., & A. Mirri, 143
Goldberger, J., G. A. Wheeler, R. D. Lillie, & L. M. Rogers, 36
Graf, H., with Theiler, 7
Granouillet, F., Do-Hun-Khoan, & Nguyen-Tan-Ngoc, 44
Grierson, A. M. M., 95
Gulati, A. N., 86
Gulbransen, R., with Browning, Cohen, & Ellingworth, 112
Gupta, B. M. D., with Knowles, 114 *bis*

H

Haas, —, 51
Harrison, E., 72
Hayden, C. E., & P. A. Fish, 34

Hegner, R., & E. Schumaker, 118
E. H. Shaw, jnr., & R. D. Manwell, 6
Helm, R., & W. Wedemann, 27
Henry, A., 87
Henry, B. S., 124
with Traum, 125
Henry, M., 60
Herrick, C. A., with Ackert, 122
Hertzog, L., 53
Hess, A., 77
Hilbert, D., with Bridré, & Donatien, 65
Hilger, A., with Rinjard, 17
Hilts, W. H., 45
van der Hoeden, J., 88
Höjer, A., with Kling, 26
Holtum, A. W., 91
Höve, K. R., with Trautwein, & Thomashoff, 61
Hruska, C., 18
Huber, F. L., with Nieschultz, 57

I

Iaknis, —, 94

J

Jacotot, H., 52, 102, 103, 129, 130

K

Kakizaki, C., S. Nakanishi, J. Nakamura, & Y. Toshijima, 64
Karmann, P., 59
Kato, K., with Niimi, 65
Kengkrasat, S., 142
Kenny, P. A. C., with Bennett, 80
Kessel, J. F., 49
Kikuth, W., 49
Klarenbeek, A., 12, 87
Klarin, E., 77
Kligler, I. J., R. S. Muckenfuss, & T. M. Rivers, 140
Kling, C., & A. Höjer, 26
Knowles, R., & B. M. D. Gupta, 114 *bis*
de Kock, G., 66
Konno, T., 56
Kowatsch, A., 48
Krijgsman, B. J., 115
Kuhn, M. J., with de Asua, Dios, & Zuccarini, 117

L

Lagrange, E., 104
Ledentu, G., 5
A. Sicé, and M. Vaucel, 119
Legg, J., 36
Lehr, E., 58
Le Louët, G., 63
with Broudin, & Romary, 43
Lerat, R., 44
Lestoquard, F., with Donatien, 78
with Sergent, Donatien, & Parrot, 116
Levaditi, C., & A. Urbain, 7
Lignières, J., 48
Lillie, R. D., with Goldberger, Wheeler, & Rogers, 36

M

McFadyean, J., 92
McKay, A. C., with Ross, 84
McKinley, E. B., 133
Magalhães, O., 22
Malfoy, F., 26
Manwell, R. D., with Hegner, & Shaw, jnr., 6
Marais, I. P., 69
Martinaglia, G., with Paine, 55, 92
Matthis, C., 12
Mazzuchi, M., 96
Mélanidi, C., & M. Stylianopoulo, 29, 63
Mélandi, C., with Blanc, & Stylianopoulo, 140
Mettam, R. W. M., 37
Meyer, C., 88
Minett, F. C., 100
Mirri, A., with Gerosa, 143
Miyamote, T., 64
Montgomerie, R. F., 14
Morcos, Z., with Beattie, & Peden, 101
Moutia, A., 42
Muckenfuss, R. S., with Kligler, & Rivers, 140

N

Nakanishi, S., 119
with Kakizaki, Nakamura, & Toshijima, 64
Nakamura, J., with Kakizaki, Nakanishi, & Toshijima, 64
Nguyen-Tan-Ngoc, with Granouillet, & Do-Hun-Khoan, 44
Nicolau, S., 32
& I. A. Galloway, 62
Nicolsky (Nikolsky), S. N., 83
with Yakimoff, & others, 45
Nieschulz, O., 2, 41, 56, 111
& F. L. Huber, 57
Niimi, K., & K. Kato, 65
Noble, C., 72

O

Oboldouef, G., & J. Galouzo, 46
Oehl, —, 105
Ogura, K., 76

P

Paine, R., & G. Martinaglia, 55, 92
Pallarés, E., 56
Panisset, L., 6
Parrot, L., with Sergent, Donatien, & Lestoquard, 116
Pavlovsky, E. N., 124
Pawan, J. L., 70
Peden, D., with Beattie, & Morcos, 101
Petot, M., 69
Penrose, J. S., with Fairley, 85
Plantureux, E., 133
Poisson, —, & Randriambeloma, 124
Ponomareff, A. W., & N. N. Solovieff, 98
Popoff, N. P., 13
Poppe, K., 89

Q

Quevedo, J. M., 77
Quin, J. I., 66

R

Randriambeloma, —, with Poisson, 124
Rastegáïeff, E. F., 76, 83
with Yakimoff & others, 45
Reid, H. A., 144
Remlinger, P., & J. Bailly, 59, 135
Reppin, K., with Trautwein, 27
Richardson, U. F., 3
Rinjard, P., & A. Hilger, 17
Rivers, T. M., with Kligler, & Muckenfuss, 140
Robinson, E. M., with Theiler, 23
Rogers, L. M., with Goldberger, Wheeler, & Lillie, 36
Romary, A., 105
with Brondin, & Le Louët, 43
Ross, I. C., & A. C. McKay, 84
Rumball, P., 14

S

Sachs, A., 127
Sandground, J. H., 12
Schoening, H. W., 27
Schumaker, E., with Hegner, 118
Schwertz, J., 109
& L. Fornara, 110
Scott, I. P., 21
Sen, S. K., 123
Sergent, E., A. Donatien, L. Parrot, & F. Lestoquard, 116
Serra, A., 100
Shaw, E. H., jnr., 33
with Hegner, & Manwell, 6
Sheather, A. L., 23
Sicé, A., with Ledentu, & Vaucel, 119
Smith, E. C., 136
Smith, T., 126
Solovieff, N. N., with Ponomareff, 98
Spiegl, A., 47
Steck, W., 9, 30
Stévenel, L., 141
Stewart, J. R., 106
Steyn, D. G., 28, 38, 39, 67
Stylianopoulo, M., with Blanc, & Mélanidi, 140
with Mélanidi, 29, 63

T

Tang, Fei-Fang, with Ward, 139
Tarantino, G. B., 103
Teppaz, L., 29
Theiler, A., 32, 39
& P. J. du Toit, 10
& H. Graf, 7
& E. M. Robinson, 23
Theodor, O., with Adler, 78 *bis*
Thomas, A. D., 69
Thomashoff, E., with Trautwein, & Höve, 61
Tibirica, P. de Q. T., 33
du Toit, P. J., 9, 31
with Theiler, 10
Tolstoff, A. N., with Yakimoff & others, 45
Toshijima, Y., with Kakizaki, Nakanishi, & Nakamura, 64
Traum, J., & B. S. Henry, 128
Trautwein, K., 138
& K. Reppin, 27
E. Thomashoff, & K. R. Höve, 61
Turner, A. W., 97

U

Urbain, A., with Levaditi, 7

V

Vaucel, M., with Ledentu, & Sicé, 119
Veglia, F., 50
Verge, J., 55
Viljoen, P. R., H. H. Curson, & P. J. J. Fourie, 19

W

Ward, H. K., & Fei-Fang Tang, 139
Ware, F., 1
Wedemann, W., with Helm, 27
Wenyon, C. M., 4
Wetzel, R., 51
Wheeler, G. A., with Goldberger, Lillie, & Rogers, 36
Woodford, R. C., 141

Y

Yakimoff, W. L., 11
E. F. Rastegáieff, A. N. Tolstoff, & S. N. Nicolsky, 45

Z

Zeiss, H., with Boshenko, 114
with Emelin, 111
Zijp, P., 112
Zuccarini, J. A., with de Asua, Dios, & Kuhn, 117

INDEX OF SUBJECTS.*

Compiled by MISS M. H. JAMES.

Note.—Incidence, Treatment, &c., are indexed only under Diseases, and not under Animals affected by the Diseases.

Abortion, Contagious
and Bang Infection in Man, **88** *bis*, **89**
Bovine, **88** *bis*, **89, 90, 91,** 124, **125**
Agglutination Test for or in
Determination of the Non-Specific Agglutinin Content of Normal Bovine Sera and its Bearing on the Interpretation of, **91**
Discrepancies of, **125**
Reliability of, for Diagnosis, **92**
Incidence
Holland, 88
Rhodesia, Southern, **90**
Ovine ; Gers, 90
Porcine, **126**

Agalaxia, Contagious
of Sheep and Goats, Treatment by Stovarsol, a Specific, **65**

Anaemia, Canine
New Cause : *Bartonella canis*, n. sp., **49**

Anaplasmosis
Anaplasma associated with
Nature of, **9**
and Piroplasmosis, Bovine, or Tristeza, **117**
Prophylaxis
Vaccination, **48,** 72, 95-6

Antelopes, Deer, &c.
Diseases
Psoroptic Mange, 87
Tuberculosis, **55, 92**
Glandular, 55
Parasite
Coccidium, n. sp., 83

Anthrax
Bovine
Following Dehorning, **45**
Caprine
Kid-Infection by Alimentary Tract, Part played in, by Injury, **18**
in Elephants, 142
Incidence
Cyprus, 72
Russia, **45**
Siam, 142
South Africa, **19**
Infection, Experiments on, **95**
of Intestinal Origin in Sheep, **94**

Anthrax—*cont.*
Pathogenesis of, **94**
Prophylaxis, **94, 95**
Anti-Anthrax Immunization, **95**
Vaccines for
An Antagonism to *B. anthracis* Utilizable in Preparation of, **56**
Caprine Susceptibility to : Turkey, **53**
New Method with Large Doses of Virulent Bacilli and Spores, **96**
South African, Improved Methods of, **19**
Transmission of Experiments with Flies, **95**

Animals and Man, Diseases Common to, **55**

Apes, Gorillas and Monkeys
Diseases
Scarcoptic Mange, 87
Undulant Fever, 126, 127
Parasites
Amoebae, **118**
Flagellates, **118**
Pathogenicity for, of *Br. abortus* and *B. melitensis*, **126**

Arteriosclerosis, Bovine, 33

Asses
Infectious Diseases of : Sudan, 64
Plant Poisonous to, 38, 39

Bacteriology, 15–24, 52–8, 88–98, 124–8
Bacillus(i)
Anaerobic, Cultivation of, in Mass, **23**
anthracis
An Antagonism to, Utilizable in Preparation of Anti-Anthrax Vaccines, **56**
oedematicus or variant as Cause of Black Disease in Sheep, 57
Bacteria
Brucella abortus, Dissociation of, Spontaneous and Forced, **124**
and *B. melitensis*, Pathogenicity of, for Man and Monkeys, **126**
Strain of, from Swine, **125**
Brucella abortus Infection in Cattle, see **Abortion, Contagious,** Bovine

* The numbers in heavy type refer to the titles of papers summarized.

Bacteriology—*cont.*
Medium for Isolation and Subculture of Gonococci, Pneumococci, and other Delicate Organisms, **127**
Titles of Unnoticed Papers, 58, 98, 128

Bang's Disease
in Equines, Production of Suppurative Lesions, **17**
in Man, **88,** *see also* 90

Barbone
Pasteurellas of: Lysis of, Importance in, of the Reaction of the Medium, **96**

Birds, *see also* **Fowls** or **Poultry,** *& under* Names
Diseases
Malaria, **33**
Mal triste, **22**
Parasites
Eye-Worms, **13**

Black Disease (Necrotic Infectious Hepatitis)
Bovine, due to *B. oedematiens*, **97**
Ovine
Bacilli in Normal Sheeps' Livers in, **57**
in the Sudan, **128**

Blackquarter, Blackleg, or Bradsot
Clostridium chauvaei of, Differentiation of, from other Anaerobic Organisms Present in, **21**
Etiology, **21**
in Dutch East Indies; Buitenzorg, 57
Transmission of, Experiments in, with Tabanidae, **57**

Blacktongue
Canine, Identity of, with Human Pellagra, **36**
Prophylaxis
Foodstuffs, Preventive Action of, Study of, **36**

Borna Disease (Enzootic Encephalitis)
in Sheep and Cattle, **62**

Botulism or Parabotulism
Equine: South Africa, **23**

Camels and Dromedaries
Diseases of
Chronic Debility due to Echinococcosis, **123**
Echinococcosis, **52, 123**
Infectious, 64
Trypanosomiasis, 70, 71, **80**
Surra or Su-auru, **111** *bis*
Haematology of the Turkestan Species, **108**
Lymphatic Glands of, **69**

Cats, Domestic and Wild
Parasites of
Diplydium catus, n. sp., **86**
Piroplasma, **75**
Strongyloides stercoralis, **12**

Cattle and other Bovines
Diseases
Anaplasmosis, **45** *bis*, **48, 117** *bis*
Arteriosclerosis, **33**
Barbone, **96**
Black, **97**
Borna, **62**
Coccidiosis, **48, 83**
Contagious Abortion, **88** *bis*, 89, **90, 91,** 124, **125**
Contagious Pleuropneumonia, **60,** 71
Cysticercosis, **51** *bis*, **124**
Echinococcosis, **52, 85**
Encephalo-Myelitis, Enzootic, **62**
Foot-and-Mouth, **26, 27** *bis*, 61
Gaertner Infections, **56**
Haemoglobinuria, **11**
Heartwater, 30, 38
Infectious, 64
Mange, **87**
Nasal Granuloma, **107**
Pasteurellosis, **52, 53** *bis*
Piroplasmoses, **48, 116**
Babesiasis, 9, **48, 76, 77** *bis*, **117**
Tristeza, **77, 117**
Theileriasis, **46**
Rabies, 143
Rinderpest, **24, 25, 63** *bis*, **64, 103, 129,** 130, 131, 143
Trypanosomiases, **83**
Surra, 142
T. congolense Infection, **3**
Tuberculosis, 54–5
Urocystitis Haemorrhagica, **64**
Parasites
Sarcosporidia, **119**
Ticks, **124**
Trypanosomes, **109**
Phosphorus Deficiency in, **39**
Plants Poisonous to, 38 *bis*, 39

Coccidiosis
Avian, in Poultry, Therapy of, **115**
Bovine, **48, 83**
Treatment: Methylene Blue, Medicinal, **48**
Coccidia of, n. sp. from Nilghai, **83**
Incidence
Caucasus, Northern, **83**
Germany: Simmerthal, 48
U.S.S.R., 83
Ovine, **6, 83**
Porcine, Hepatic, **83**
in Rodents; Guineapigs, **48**

Dikoor, in Sheep, South Africa, **67**

Dikkopsiekte (Swelled, or Big Head) in Rams: South Africa, **66**

Dogs
Diseases
Blacktongue, **36**
Giftblaar Poisoning, 39
Jaundice, 12
Piroplasmosis, **49, 117**
Experimental, **7**
Rabies, 58, **59, 133, 135, 136,** 143
Surra, **1,** 142
Tuberculosis, 55
Visceral Leishmaniasis, **78**

Dogs—*cont.*
Parasites
Echinococcus granulosus, 86
Leptospira, **12**
Strongyloides stercoralis, **12**
Thelazia callipaeda, 123

Domestic Animals, *see also* **Food Animals,** *and under Names*
Infectious Diseases
Siam, 64
Sudan, 142
Normal Blood of Some (*tables*), **34**
Plants Poisonous to, or Suspect as, **37, 38, 39, 67,** 68

Ecythma Contagiosum
of Sheep and Goats, South Africa, **32, 69**

Elephants
Diseases
Anthrax, 142
Surra, 142

Encephalitis, Enzootic
Experimental
Histo-Pathological Changes in Supra-Renal Bodies and Salivary Glands in Rabbits Dead of, **32**

Encephalo-Myelitis, Enzootic, *see* **Borna Disease**

Entomological References
Flies (various Species), Transmission Experiments with, and Anthrax, **56**
Mosquitoes, Transmission by, of Fowl-pox, **140**
Otodectes, in Silver Foxes, 87
Stomoxys nigra Vector of Surra: Mauritius, **42**
Tabanus(idae)
Transmission Experiments with and Blackquarter, **57**
Surra, **2, 41**
Ticks
Control of, Russia: Anti-Tick Bath, Novgorod Province, **124**
Diseases Spread by, Transmission of, by Intra-Jugular Injection of the Emulsified Intermediary Host, **10**

Equines, *see also* **Asses, Horses, & Mules**
Diseases
Bang's, **17**
Botulism (Parabotulism), **23**

Filterable Viruses, Diseases due to, 24–9, 58–64, 98–105, 129–41
New Fowl Disease: Egypt, **104**
Virus of Herpetic Encephalitis and of Vaccinia, Filtration of, Note on, **139**

Foot-and-Mouth Disease
Disinfection in, **100**

Foot-and-Mouth Disease—*cont.*
Infectivity of Urine, Faeces, Bile and Milk of Animals Suffering from, **61**
in Rodents, Transmission by Contact, **101**
Spread of, Method of, **26**
by Rodents and Birds, **101**
Virus of
Different Types of, Reaction of Complement Fixation as Means of Identifying, **138**
Effects on, and on the Fowl Cholera Bacillus, of Certain Disinfectants, **27**
Resistance of, to Ultra-violet Rays: Effect of Irradiation on Course of Disease in Guinea-pigs, **138**

Fowl Cholera or **Fowl Plague** or **Pox**
Parasites
Bacillus of, Effects on, of Certain Disinfectants, **27**
Pasteurellas of; Lysis of, Importance in, of the Reaction of the Medium, **96**
Prophylactic Vaccination for, **54**
Transmission by Mosquitoes, **140**

Fowls=Poultry, including Chickens
Diseases
Coccidiosis, **115**
Fowl Cholera, **27,** 54, **96, 140**
Leg Weakness, **69**
New, Caused by a Filterable Virus, **104**
Rabies, **59**
Parasites
Ascaridia lineata, **122**
Balfour Bodies, **120**
Piroplasma, **115**
Worms, **14**

Foxes, Silver
Parasites
Otodectes cynotis, 87
Lung Worm, **87**

Gaertner Infections in Cattle and Guineapigs, Japan, **56**

Geeldikkop
in Sheep and Goats; Cape Province, Recent Investigations into, **66**

Goats
Diseases
Anthrax, **18**
Contagious Agalaxia, **65**
Contagious Pleuropneumonia, **29,** 65
Echinococcosis, **52**
Ecthyma Contagiosum, **32,** 69
Geeldikkop, **66**
Infectious, 64
Rinderpest, Experimental, **133**
Surra, 142
Variola, **140**
Plants Poisonous to, 38, 39
Susceptibility of, to Anthrax Vaccine, Turkey, **53**

Granuloma Nasal, Bovine
Bihar and Orissa: Infection: Treatment, **107**

Haemoglobinuria
Bovine: N. Caucasus: Third Cause of, **11**

Heartwater
Etiology, 38
Pathological Studies on, **30**
Transmission Experiments, 10

Helminthology
Book on, Reviewed, **73**
Diseases
Cysticercosis
Bovine
Generalized in Calf, **51**
Incidence
Germany, 51
Madagascar, **124**
Syria, **51**
Tunis, **52**
Porcine: Madagascar, 124
Distomatosis
Treatment by Distol, **124**
Echinococcosis=Hydatid Cyst Disease
in Camels, **123**
of Food Animals: Tunis, **52**
in Herbivora and Porcines: Victoria, Australia, **85**
in Syria, in Man and Animals, **51**
Filariasis and other Forms
Microfilariasis, Equine: Tunis, **13**
Parasites
Filaria, 13
Microfilariae in Horses: Mona, **123**
Habronemiasis, Pulmonary, Equine: Brazil, **121**
Trichostrongylosis in Sheep: Holland, **86**
Parasites
Ascaridia lineata, Effects of, on Growing Chickens, **122**
Ascaris lumbricoides, Ova of, and of *A. suum*, Longevity of, **122**
Dipylidium Genus, Note on, **86**
catus, n. sp.; Almora; India, **86**
Eye-worms of Birds, Queensland, **13**
Fasciola hepatica, Development of, in Final Host, **84**
Lung Worm in Silver Foxes, **87**
Stephanurus morai, n. sp., in Pigs, **121**
Strongyles of Equines
Germany, **51**
U.S.S.R., **13**
Strongyloides stercoralis Infection, in Dogs and Cats: Susceptibility Resistance and Acquired Immunity to, **12**
Tapeworms, n. sp., **86**
Thelazia callipaeda, Studies on, **123**
Worms, of Poultry, **14**

Hepatitis, Necrotic, Infectious, *see* **Black Disease**

Horses
Diseases
Anthrax, 142
Epizootic Lymphangitis, 71–2
Giftblaar Poisoning, 39
Goundou-like, **36**
Infectious, 64
Microfilariasis, **13**
Osteomalacia, **65**
Piroplasmosis, 72
Pulmonary Habronemiasis, **121**
Rabies, 143
Senecio latifolius Poisoning, 38
Trypanosomiases
Dourine, **43**
Surra, 42–3, 111, **112**, 142
Parasites
Microfilaria, **123**
Tridontophorus tenuicollis, **51**

Jaundice
Ovine: Australia, **106**

Leg Weakness in Poultry: South Africa, **69**

Leishmaniasis
Canine, Visceral: Algeria, **78**
Dermal
Treatment by Synectol; Cure, **44**
Leishmania tropica
Attempted Transmission of, by *Phleb. papatasii*, **78**
Transmission of, by *Phleb. sergenti*, **78**
in Wild *Phleb. papatasii*, **78**

Liver-Rot
Ovine
Treatment by Carbon Tetrachloride: Stage at which the Fluke is Assailable by the Drug, and the Bearing thereon of Dosage, **14**

Lymphangitis,
Epizootic or Cryptococcosis
Incidence
Guadeloupe, **24**
Sudan, 71
in Mules, **24**
Porcine, **105**
Treatment
Nainsouta Method, 71–2
Ulcerative; Treated by Intravenous Injections of Biniodide of Mercury, **29**

Malaria, Avian
Treatment of, Therapeutic Significance in, of the Adsorption of Chemical Compounds by Red Blood Corpuscles, **33**

Mal triste
Avian: Brazil, **22**

Man
Diseases of, and of Animals, **55**
Bang Infection, **88** *bis*, **89**
Dermal Leishmaniasis, **44**
Echinococcosis, **51**

Man—*cont.*
Diseases of, and of Animals—*cont.*
Melioidosis, **55**
Pellagra, **36**
Rabies, 143
Tuberculosis, **94**
Undulant Fever, **15,** 33, 90, 126
Parasites of
B. abortus and *B. melitensis*, Pathogenicity of, **126**
Spirochaetes, **12**
Thelazia callipaeda, **123**

Mange
Transmission of, from Rats to Bovines, **87**
Various Kinds, Causal Agents of, **87**

Melioidosis
in Man and in Animals, **55**

Metazoan Parasites, Diseases due to, 12–15, 50–2, 84–7, 121–4
Infection by (*see also* Helminthology), **12**
Titles of Unnoticed Papers, 52, 87, 124

Miscellaneous, 29–39, 64–70, 105–8, 141–3
Blood, Normal, of Some Domesticated Animals, **34**
Carbon, Colloidal, Intravenous Injection of, in Human and Veterinary Medicine, **33**
Chaulmoogra Oil, Active Principle of, **141**
Goundou-like Condition in Pony, **36**
Haematology of the Turkestan Camel, **108**
Infectious Diseases of Domestic Animals in Siam, the Most Commonly Occurring, **142**
Lymphatic Glands of Camels, **69**
914, as Adjuvant to Certain Chemical or Serum Treatments of Animals: Indo-China, **105**
Romanowsky Stain, Use of, in the Tropics, **70**
Stock, Phosphorus Deficiency in, **39**
Strychnine Poisoning in Sheep: Queensland, **36**

Mules, Epizootic Lymphangitis, of, **24**

Mycology, 24, 105
Dermatophytes, Characters of, Variability of, **105**

Oesophagostomiasis
OVINE, South Africa, **50**

Osteomalacia
EQUINE: Experimental Studies on, **65**

Pasteurellosis(es)
BOVINE
Incidence
Algeria
Boulhaut Area, **53**
Kenitra Region, **53**
Indo-China, **52**
Prophylaxis: Vaccination, **54**

Pigs, *see* **Swine**

Piroplasmoses (Plasmoses), BABESIASIS, including Red Water, Texas Fever, &c., & THEILERIASIS, including East Coast & Egyptian Fevers
BABESIASIS
BOVINE
Histological Studies on, **9**
in Palestine
Etiology; Symptomatology; Treatment, **116**
Prophylaxis: Vaccination, **48**
Transmission Experiments, 11
Treatment
Hexamethyamintetramine, **77**
Tristeza
Parasites causing, **77**
Treatment, **117**
CANINE
Chronic, Anaemia in; New Cause, **49**
Treatment, **117**
EQUINE
Quinine Hydrobromide in, **72**
EXPERIMENTAL
Canine: Treatment Experiments, **7**
Incidence, All Forms, All Animals
Algeria, 48, 118
Argentina, 48
Asia, Central, **46**
Egypt, **115**
France, 117
Germany, **47**
Japan, **76**
Palestine, **116**
Sudan, 72, **117**
Sweden, 77
OVINE, in Germany, **47**
PARASITES associated with
Responsible for Tristeza in Bovine, **77**
Babesiellas in N.W. Russia, Identification of, **76**
Piroplasma in
Fowls Egypt, **115**
Sudanese Wild Cat, **78**
Prophylaxis
Vaccination, **48**
Stockholm Methods, **77**
THEILERIASIS
BOVINE, in Central Asia, **46**
Treatment, All forms in all places, **116,**

Pleuropneumonia, Contagious
BOVINE, **71**
Australia, Problem of, **60**
Sudan, 71
Virus of, Morphological Study of, **104**
CAPRINE: Greece, **29**

Porcupine: *Trichomonas* of, **114**

Poultry, *see* **Fowls**

Plants referred to
Poisonous or Injurious to Stock
Geigeria passerinoides, 31
Gifblaar: South Africa, **39**
Panicum maximum, Suspect as Cause of Dikoor in Sheep, South Africa, 68

Plants referred to—*cont.*
Poisonous or Injurious to Stock—*cont.*
Recent Contributions to Knowledge of, **37**
Tulp, **38**

Protozoology, 1–12, 41–50, 75–84, 109–21
PARASITES
Amoebae and Flagellates from Chimpanzee, Three-Toed Sloth, Sheep, and Guineapig, **118**
Balfour Bodies in Fowls' Blood, **120**
of Domestic Pigs, **49**
Embadomonas ovis, 119
Françaiella colchica, n. sp., Third Cause of Bovine Haemoglobinuria in Northern Caucasus, **11**
Gonderia mutans or *Theileria mutans*, **7**
"Grenade Bodies" in Development Cycle of, **116**
Nomenclature, 117
Leptospira, from Canine Leptospiral Jaundice, Experimental Inoculations with, **12**
Sarcosporidia in Korean Cattle, **119**
Sporozoon of Guineapigs, Schizogonous Forms of, **119**
Tricercomonas of Pigs, **114**
Trichomonas of Porcupines, **114**
Titles of Unnoticed Papers, 50, 84, 121

Rabies
Animal, Recovery from, Spontaneous, **58**
Animals affected by; Siam, 143
AVIAN, in Poultry, **59**
CANINE
Nigeria, **136**
Incidence
Morocco, **135**
Nigeria, 136
Siam, 143
Myocarditis in, **100**
Prophylaxis
Immunization against the Disease, Value in, of the Haemato-Cephalic Barrier, **136**
Vaccination
of Dogs, **59, 133**
Morocco, **135**
Vaccine for
Canine Rabies, **59**
Single Injection: Results, **27**
Preparation of,
New Method of, **98**
Use of this Vaccine for Production of Anti-rabic Serum of High Value, **98**

Reports, 70–2, 90
Cyprus; Director of Agriculture (1927), 72
Kenya: Dept. of Agriculture (1927), 72
Southern Rhodesia, Director of Veterinary Research for (1928), 90
Sudan: Veterinary Dept. (1927), 70

Reviews, 73–4, 143–5
Diseases of Animals in Tropical Countries (Edmonds & Walker), 73
Manual, A, of Helminthology, Medical and Veterinary (Baylis), 73–4

Reviews—*cont.*
Sterilitá degli animali domestici (Eziologia—Diagnosi—Profilassi eCura) Gerosa & Mirri, 143
Use, The, of Iodine and its Compounds in Veterinary Practice (Reid), 144

Rinderpest
Experimental, in Goats, **133**
Immunity in, Types of, **103**
Incidence
Eritrea, 103
Greece, 63
Indo-China, **63**
Kenya, 72
Siam, 143
Somaliland, 103
Uganda, **25**
Infection, Inapparent in, **102**
Observations on, **24**
Organic Liquids, The, in, **26**
Prophylaxis
Anti-Rinderpest Serum
Preliminary Field Research: Uganda, **25**
Experiments on: Kenya, 72
in Indo-China, **63**
Vaccination
by Means of Organ-Pulp, 129
Attempt to Utilize in Hyperimmunization of Anti-Rinderpest Serum Producers, **130**
Vaccine for, Experiments on, **64**
Formolized, **131, 133**

Rodents
Guineapigs, Coccidiosis in, **48**
Parasites of
Amoebae, **118**
Sporozoon, **119**
Rabbits
Diseases
Aberrant Psoroptic Mange, 87
Parasites
Thelazia callipaeda, 123

Sheep
Diseases
Anthrax, **94**
Black Disease, **57, 128**
Borna, **62**
Coccidiosis, **6**
Contagious Abortion, 90
Contagious Agalaxia, **65**
Dikoor, **67**
Echinococcosis, **52, 85**
Ecthyma Contagiosum, **32,** 69
Encephalo-Myelitis, Enzootic, **62**
Geeldikkop, **66**
Infectious, 64
Jaundice, **106**
Liver Rot, **14**
Oesophagostomiasis, **50**
Piroplasmosis, **47**
Skin, Undescribed, South Africa, **68**
Swelled or Big Head (Dikkopsiekte), in Rams, **66, 106**
Trichostrongylosis, **86**

Sheep—*cont.*
Diseases—*cont.*
Trypanosomiasis, **114**
Surra, 142
Vomeersiekte (Vomiting Sickness), **31**
Parasites of : Amoebae, **118**
Plant Suspect as Poisonous to, 68
Plants Poisonous to, 38, 39
South Indian, Facts regarding, **141**
Strychnine-Poisoning in, **36**

Skin Diseases, Undescribed, of Sheep, South Africa, **68**

Sloth, Three-toed, Amoebae of, **118**

Spirochaetoses
Spirochaetes associated with
Rodent and Human, Dakar, Identity of, **12**

Su-auru of Camels, **111**

Swelled Head in Ram Lambs
Australia, **106**
South Africa, **66**

Swine
Diseases
Contagious Abortion, **126**
Cysticercosis, 123
Echinococcosis, **52, 85**
Epizootic Lymphangitis, **105**
Hepatic Coccidiosis, **83**
South African Virus, **28**
Surra, 142
Parasites
Protozoal, **49**
Stephanurus morai, n. sp., **121**
Tricercomonas, **114**

Trypanosomiases
Glossina associated with, Probable Limits of, in Zululand, **15**
Trypanosomes
Action on, of Derivatives of Anil and Styryl Quinoline, **112**
Parabasal Body in, Loss of, **4**
Species referred to, by Names
congolense, Infection of, Bovine, Treatment by Antimony Pot. Tartrate, **3**
congolense-dimorphon, Infection of, Pathological Histology in, **110**
vivax-cazalboui and *congolense-dimorphon*, Leishmania-like Phase in Development of, in Vertebrate Hosts (Bovines), **109**
TRYPANOSOMIASES
ANIMAL
BOVINE, **83**
of CAMELS
Control of, 70
Diagnosis of, Mercuric Chloride as an Agent for, **80**
DOURINE
Diagnosis, **6**
Formol-Gel Test as Aid to, **43**

Trypanosomiases—*cont.*
TRYPANOSOMIASES—*cont.*
ANIMAL—*cont.*
DOURINE—*cont.*
Prevention, **6**
Treatment, **6**
EQUINE
Surra, or Su-auru, **111** *bis*, **112, 142**
Incidence : All Forms
Belgian Congo, 109, 110
Dutch East Indies, 111, 112
Guadeloupe, **83**
India, 1
Indo-China, 42
Mauritius, **42**
Siam, 142
Sudan, 80
Sumatra, **41**
Uganda, 3
U.S.S.R., **114**
Zululand, **2**
NAGANA : Zululand, **2**
OVINE : Russia, **114**
Prophylaxis, Naganol in, **111**
SURRA
Animals affected by : Siam, 142
in Camels, 111
CANINE in Foxhound Pack, **1**
EQUINE, 111 *bis*, **112, 142**
Treatment with Sulfarsenol and 309 Mixture, **43**
Incubation Period of, **111**
in Mauritius, *Stomoxys nigra*, Principal Vector, **42**
Problem of
Transmission Experiments with *Tabanus rubidus*, **2**
Zoological Contributions to, **111**
Transmission Experiments with, **111**
with Tabanidae, **41**
Treatment, **42**
Treatment
Atoxyl, **112**
Naganol, **111, 112**
Trypanocidal Action of Some Derivatives of Anil and Styryl Quinoline, **112**
EXPERIMENTAL
Crisis in, Mechanism of, **44**
Trypanotoxins, **5**

Tuberculosis
Incidence in
Animals,
French West Africa, **54**
Sudan, 70, 71
Dogs, **55**
Wild Buck, in Natural Conditions, **92**
Man, Prophylaxis ; Vaccination of Newborn Children by B.C.G. Results, **94**

Undulant Fever
Brucella abortus, from Human Source, Identification of, **15**
Incidence in
Apes, 126, 127
Man, **15,** 90, 126

Undulant Fever—*cont.*
Incidence in—*cont.*
Man—*cont.*
Gers, **90**
Rhodesia, Southern, **90**
Treatment of, in Man, by Intravenous Colloidal Carbon, **33**

Urocystitis Haemorrhagica
BOVINE: Formosa, **64**

Variola, CAPRINE: Greece, **140**

Vomeersiekte (Vomiting Sickness) in Sheep
Cause of, Investigation into, **31**

Vuilbek, *see* **Ecthyma Contagiosum**